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ELECTRIC RAILWAY TRACTION

A Supplement illustrating and describing developments in Electric Railway Traction is presented with each copy of this week's issue.

Canadian Railway Wages Settlement

A SETTLEMENT is announced of the dispute between the employees and the managements of the Canadian Railways as to the method of restoring the existing 10 per cent. cut in basic wage rates. An application was filed last year by the employees for a board of conciliation under the Industrial Disputes Investigation Act, and before this board they asked for the complete abolition of the 10 per cent. deduction during 1937. The majority report of the conciliation board, dated January 30 this year, considered this impracticable, estimating that it would cost the railways \$18,000,000 a year, and recommended instead reductions of the cut to 9 per cent. from February 1, to 8 per cent. not later than August 1, and to 7 per cent. not later than November 1. Further reductions were to be on a sliding scale based on increases in gross revenues. The two railway administrations have acted on this recommendation to the extent of reducing the deduction to 9 per cent. as from February 1. The employees would not, however, accept the recommendations, and there had for some time been fears of a widespread strike. Under the new agreement the ten per cent. cut is to be removed by progressive steps within the twelve months dating from April 1, 1937.

Preliminary Railway Returns

The preliminary returns relating to British railways (other than London Transport lines) in 1936 which were issued on Wednesday by the Ministry of Transport show that in comparison with 1935 the total railway receipts of £164,000,000 increased faster than the expenses of £130,600,000 so that the operating ratio was 79.6 per cent. in 1936, against 80.79 per cent. in 1935, and net receipts improved from £30,300,000 to £33,400,000. In railway receipts the increase was £6,290,000 or 3.99 per cent., and in railway expenditure it was £3,190,000 or 2.50 per cent. Net revenue from all sources was £36,500,000 in 1936, against £33,695,000 in 1935 and £32,255,000 in 1934, and the average rate of interest and dividend paid per cent. of capital receipts rose from 2.97 in 1934 to 3.08 in 1935 and 3.26 in 1936. Passenger train traffic in 1936 produced £72,200,000, an increase of £2,194,000 over 1935, and goods train receipts advanced from £86,237,000 to £90,200,000. Ancillary businesses brought in a profit of £900,000 in 1936, comparing with one of £629,000 in 1935 and of £614,000 in 1934.

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The Week's Traffics

As the latest traffic returns of the four group companies are for Good Friday week and compare with those for an ordinary week in 1936, there is naturally a big increase in their passenger train receipts, with decreases, though much smaller, in merchandise. Coal also shows an improvement, except on the L.N.E.R. Passenger train earnings for the past week on the L.M.S.R. amounted to £637,000, a decrease of £34,000 in comparison with Good Friday week 1936; on the L.N.E.R. to £381,000, a decrease of £11,000; on the Great Western to £268,000, an increase of £1,000; and on the Southern to £392,000, an increase of £3,000. Merchandise receipts show the following changes in comparison with Good Friday week, 1936: L.M.S.R. + £3,000, L.N.E.R. + £15,000, Great Western + £14,000, and Southern - £2,500.

	12th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	%
L.M.S.R.	+217,000	-60,000	+20,000	+177,000	+532,000	+3.94
L.N.E.R.	+116,000	-48,000	+7,000	+61,000	+198,000	+1.97
G.W.R.	+101,000	-17,000	+14,000	+98,000	+243,000	+4.43
S.R.	+136,000	-11,500	+500	+125,000	+161,000	+3.97

Total receipts of the four companies for the past week were £3,268,000, an increase of £62,000 on Good Friday week 1936.

* * * *

Paisley and Renfrew Centenary

On April 3 the Paisley and Renfrew section of the L.M.S.R. celebrates its centenary, for on that date in 1837 the line was opened. This curious little line, only 3½ miles long and entirely isolated from other lines at the time it was opened, connected the Thread Town with the village of Renfrew on the south bank of the Clyde. The company was incorporated on July 21, 1835, and the proprietors aimed at turning Renfrew into the "seaport" for the important manufactures of Paisley. At that time there was no railway communication between Paisley and Glasgow, and, although the distance between the two places was only nine miles, transport was often difficult. The Paisley and Renfrew line never was very successful; after a few years the engines were withdrawn, and horses were employed to cope with the traffic. It is recorded that when the important Glasgow, Paisley, Kilmarnock and Ayr line was opened in 1840 the proprietors were greatly assisted by being able to obtain the services of the P. & R. guard. Incidentally, the Paisley & Renfrew Railway Company was absorbed by the G.P.K. & A.

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under an Act of July 22, 1847. The small railway thus later became a part of the Glasgow and South Western, and at present a service of L.M.S.R. trains from Glasgow makes Renfrew its terminus.

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Indian Railways and the Reforms

Outside India, Whitehall, and India House there appears to be some uncertainty as to the effect of that great day of changes for India, yesterday April 1, upon the railways of that Empire. It is true that this "milestone in history" marks the coming into being of the Provincial Ministers and Councils and the initiation of Provincial autonomy. The Governor-General has also assumed his new powers, and Burma and Aden have been separated from India, so that great changes have already taken place. But in the nature of their composition the Federal Government, Federal Court, Public Services Commission and Railway Authority cannot materialise until the Provinces have settled down and elected representatives to the former, or until the thorny question of Federation for the Indian States is settled. The Railway Authority may come into being before the latter settlement, but as four-sevenths of its members have to be appointed by the Federal Government—the other three-sevenths being appointed by the Governor-General in his discretion—its inauguration must await the formation of a Federal Government. The composition and powers of the Railway Authority (or Statutory Railway Board) were outlined in a leader in our issue of November 24, 1933, as then proposed by the Secretary of State's committee and subsequently embodied in the Government of India Act, 1935. So far as railways are concerned therefore, the great event of immediate import is the establishment of an autonomous Burma Railways administration and this is dealt with in an editorial on page 645.

* * * *

The Present Indian Political Crisis

But apart from there being no other changes in Indian railway administration imminent, the effects of the present political tangle in that country may in certain circumstances be vital to British railway personnel, and also of indirect concern to the stockholders of the companies' lines, for the following reasons. It may first be explained that the most important sections in the Government of India Act, 1935, lay down very clearly the special responsibilities of the Governor General (Viceroy) and of the Governor of each Province. The particular responsibilities of a Governor include the following:—

- (a) The prevention of any grave menace to the peace or tranquillity of the Province.
- (b) The safeguarding of the legitimate interests of minorities.
- (c) The securing to past and present members of the public services and to their dependants of their rights, and the safeguarding of their interests.
- (d) The securing of the rights of British interests in India, and the prevention of discrimination against them.

A general election has resulted in the Congress party obtaining majorities in six of the eleven provinces. This party is pledged to complete separation of India from the British Empire, and many of its leaders advocated the policy of refusal to accept office in cases where majorities offered the opportunity for formation of Governments in Provinces, but it was eventually decided to accept office only if the Governor of the Province concerned promised not to exercise his special responsibilities just enumerated. In other words the six Governors were asked by Congress to contravene the Act, flout the British Government, and

leave all British interests in their respective Provinces to the mercy of professed anti-British elements. As obviously no Governor could countenance such a suggestion, Congress has refused to take office, and coalition Governments are at present being formed in at least some of the six Provinces.

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Early Station Roofs

Pictures, such as the one we reproduce on page 653 this week, of early railway terminal stations with great roofs covering half a dozen or more tracks that do not serve platforms, give rise to speculation as to whether the designers of those days were not so subject to that control by finance which now so cramps spacious schemes, or whether everyone concerned was so far-sighted as to anticipate the growth of traffic and consequent need for more platforms. Besides St. Pancras, the subject of our picture, Paddington, was probably the most notable example in London of a similarly ambitious roof, and how economical it eventually turned out to be may be judged by the additional platforms which have since found cover beneath it. There must be few examples remaining more or less in their original state, but Kingsbridge, the chief Dublin terminus of the Great Southern Railways, is one which still has its two main platforms—arrival and departure—separated by a number of lines used as carriage sidings under the same roof.

* * * *

The Open Regulator

In the course of his presidential address delivered at a meeting held on Sunday, March 21, of the Federation of Enginemen's Mutual Improvement Classes, Mr. L. P. Parker, having adopted the title "The Open Regulator" entered a well considered plea for the *fully* open regulator in conjunction with short cut-off in the handling of modern locomotives, though he said that he felt he was preaching to the converted when he advocated that method of driving. Realising that some at least among his hearers would not be familiar with the underlying scientific reasons for the success of the method, the President very rightly went on to explain that the reason for using a full open regulator was that by so doing the thermo-dynamic efficiency was increased, or in other words, the ability to obtain as much work as possible from the steam was secured. Provided the engine will stand it, it is almost, but not quite, correct on all occasions to open the regulator wide, and to govern the power and speed of the engine by adjusting the valve gear according to the work which has to be done. Having laid down this principle the author went into matters of cause and effect and the results which should follow this and other methods of controlling the locomotive. In his summing up, the President reaffirmed his contention that the best method of handling the locomotive under modern conditions was that of running with the regulator wide open and the motion linked up to the point which gives the desired running speed.

* * * *

A Military Railway Signalling School

Railway signalling schools, equipped as far as possible with full-sized apparatus working in conjunction with a model railway layout on which trains can be run in regulation manner, have steadily found favour since their introduction, some thirty odd years ago, if we remember rightly. Both in this country and the Dominions and Colonies, as well as in some foreign countries, many such schools are now to be found. Perhaps the fascination of playing with trains—which seems undiminished by the spread of other methods of transport—has something to

do with the attraction they undoubtedly possess, and facilitates their effective use. On page 659 we publish an article by Major F. Biddulph, M.C., R.E., Instructor at the Railway Training Centre, describing the school at Longmoor Camp, the training centre for railway constructional and operating troops. Its equipment follows the same general lines as in other schools, with some modifications, explained in the article, necessary to meet the peculiar requirements of military railways. These may include the possibility of having to carry on traffic over a captured line with the minimum of apparatus to begin with, to open a hastily constructed one with the minimum delay and reasonably safe working, or to meet some other special conditions. At the same time standard British operating methods can be thoroughly learned. We are not aware if foreign systems of working are ever dealt with in the instructional courses, but some information on their leading features might conceivably be useful to military officers.

* * * *

Another Route Setting Installation

On page 656 we publish a description of some new power signalling equipment on the Cheshire Lines at Brunswick, Liverpool, embodying not only the route-setting principle, already in use to some extent in this country, but the method of identifying and selecting a particular route by operating keys and buttons corresponding to its beginning and end in the area—or portion of it—concerned. Route lever working is, of course, not new, having been widely used in France for a long time, but it is claimed for the NX system that it combines previous ideas with certain fundamental improvements, such as the use of a control panel giving a picture of the interlocking area, an arrangement growing in favour with many railway officers who consider it minimises the mental and physical effort required to operate, in comparison with the more conventional type of power frame, and so enables larger areas to be controlled by the signalman. At the same time the NX panel apparatus is said to be more readily operated by any authorised person having little or no previous acquaintance with the layout, owing to the ease with which the routes, their beginnings and ends, can be identified from it. With these advantages the working of the new installation will therefore be watched with widespread interest.

* * * *

The Evolution of the Route Lever Idea

It was probably an Englishman, C. E. Carr, who first published a suggestion for route-lever working in 1889, but we are not aware that he constructed anything. Not long after, however, the idea took shape in France. Monsieur Cossmann, at one time Chief Engineer for Traffic Working on the Nord, as he explains in a remarkable study of the subject written in 1902, submitted proposals to his management in 1898 distinctly embodying it; they formed the basis for an order given in 1901 to Trayvou, of Lyons, for a Bianchi hydraulic installation. His chief object, it is quite clear, was not to save levers—handles would be a better term—but to simplify the signalman's work, so that one need only know the origin and destination of a train movement in the signal-box area, or "*d'où l'on vient et où l'on va*," to quote his own words, in order to set and signal the required route by a mere gesture or two. Monsieur Cossmann further declared, rightly, as we think, that power working could give us its maximum benefit only if we accepted some such principle and "boldly started out along novel lines." These views were again clearly expressed by Monsieur Tettelin, also of the Nord, during the discussion on power signalling at

the Berne Congress in 1910, by which date several route-lever installations were in use, beginning with the Bleyne-Ducousso one at Bordeaux, Midi, in 1903. Monsieur Descubes, at one time Chief Engineer of the Est, turned his attention particularly to developing the entrance and exit principle, partially formulated by Monsieur Cossmann, and beginning at Nancy in 1909, first with electro-mechanical and later purely electric mechanism, laid down many installations, as described by Monsieur Lecomte, now Assistant Engineer, in the *Revue Générale des Chemins de fer* for November last. At the Gare de l'Est, Paris, which has 31 platform and 3 postal van lines communicating with 9 lines outside, 180 light signals and 233 points, one signalbox containing 187 handles controls 3,818 distinct movements.

* * * *

The Boiler's the Thing

When all due respect has been paid to those who gauge the effectiveness of a locomotive almost entirely by the amount of tractive force it exerts, the fact cannot be overlooked that, other things being equal, it is the boiler that counts. How often has it happened that an otherwise well designed engine having all the attributes necessary for success has in practice been found wanting, more particularly at times of stress, for no other reason than that of its being under-boilered, a bad steamer, or possessing some fault in the design of the boiler which stands in its way. Improvements in the design of the boiler can also be relied upon to augment the efficiency of a locomotive already ranking as satisfactory on general grounds, and this, we think, will happen in the case of the Southern Railway "Lord Nelson" class engine No. 857, *Lord Howe*, which Mr. Maunsell has fitted with a new, enlarged, boiler having a tapered barrel and round-topped firebox with combustion chamber. We would call the attention of our readers to the particulars given on page 661 of this issue in an illustrated article showing in what respects the new boiler differs from the standard one in the distribution of its heating surfaces, size and disposal of the tubes, and the means by which, in spite of the larger boiler dimensions, the weight of the engine remains approximately the same.

* * * *

Garratt Locomotives for Express Working

Tests now in progress on the main line of the Northern Railway of France with one of the large Beyer-Garratt 4-6-2 + 2-6-4 engines recently built for express service on the Algerian Railways, are producing some remarkable results. Not only do these engines appear to be easily capable of over 3,000 h.p. at the drawbar, but the notes we publish on page 672 this week seem to establish beyond any doubt their complete suitability for normal high speed express work on such lines as that between Calais and Paris, with its long, easily graded sections, upon which sustained high speed is necessary in order to keep time with the fast boat trains, and its occasional heavy pulling uphill. These new engines, despite their comparatively small driving wheels (5 ft. 11 in. diameter), are easily capable of maintaining the normal French maximum of 75 m.p.h., and, as will be noted, where the speed limit has now been raised on the Nord main line above the former legal maximum, 82 m.p.h. was attained. As a dramatic demonstration of quick acceleration, the exit of this engine from Paris on a recent occasion with a load of 580 tons was impressive; 62 m.p.h. was attained at St. Denis, less than four miles from the start, and within a very short time, up the long succeeding gradient of 1 in 200, 75 m.p.h. was reached and sustained, the output at the drawbar being equivalent to about 3,000 h.p.

Railwaymen at War

SIR SAM FAY, who was General Manager of the Great Central Railway from 1902 until it became one of the constituent companies of the London & North Eastern Railway in 1923, and is at present a Director of the Buenos Ayres Great Southern and Western Railways, was appointed Director of Movements at the War Office in 1917, and became Director General of Movements and Railways in March, 1918, retaining that office until May, 1919. After a lapse of eighteen years, he has now published an account of his experience in that office under the somewhat equivocal but almost too truthful title of "The War Office at War." This is characteristic of his modesty and restraint; but as it happens, the work (which we review on page 647) suffers not at all from the delay, since the most important lesson it has to teach, the necessity of preparing beforehand an efficient organisation for the control and direction of transport during war, is especially opportune at the present time, when the political situation throughout the world is menacing and uncertain in the extreme. An impression of the author's graphic style may be gained from the selections from his book to which we devote our Scrap Heap page this week.

Sir Sam Fay's proposal, summarised in our review, that we should set up now in peace time a skeleton organisation of transport experts which could be expanded into a fully-equipped transport directorate on the declaration of an emergency, deserves the serious consideration of all the authorities concerned, both civil and military. Under the control of the War Office and the Railway Executive Committee, it would make all the necessary preparations and collect all relevant information as to transport progress so as to be ready to function without friction or dislocation on the outbreak of war. There are important factors present now which did not exist in 1914; not only are the British railways amalgamated and increasingly accustomed to work smoothly together, but there is now a department of State charged with the control of all forms of transport. In our view, the organisation which Sir Sam Fay suggests should be set up under the control of a joint committee representing the War Office, the Ministry of Transport, and the railways, and including representatives of labour, to prepare in detail plans not only for the initial stages (which worked with remarkable smoothness in 1914) but also for the operation of D.G.M.R. at headquarters—perhaps the Defence Ministry rather than the War Office—and of D.G.T. in the field.

Concerning the future of war-time transport, Sir Douglas Haig wrote: "The successful co-ordination and economic use of all the various kinds of transportation requires most systematic management based on deep thought and previous experience." The urgency of such an organisation as Sir Sam Fay has outlined is emphasised by his allusions to the difficulties which arose in the great war out of a lack of it. Divided control caused the ordinary and light railways actually at the front to be something of a law unto themselves, whither rolling stock was apt to vanish for considerable periods, to the detriment of the transport organisation as a whole. It is in furnishing that "deep thought and previous experience" of which Sir Douglas Haig wrote that the value of a permanent organisation for war time transport would show itself. By its continuous contact with railway developments under normal conditions, it would assure the provision in case of emergency of a planned transport structure ready to work at short notice with maximum efficiency. Such an organisation could largely avoid the dangerous delay involved in catching up with requirements, for through its railway members it would have constantly at its disposal the latest resources of transport progress.

Palestine Railways

THE 999 route-kilometres of line operated by the Palestine Railways Administration traverse three States—Egypt, Palestine, and Trans-Jordan—and serve country of widely differing character, besides varying in gauge and ownership. Of the 532 km. of standard-gauge line, 329 are in Palestine, are known as the Palestine Railway, and are the property of the Palestine Government. The remaining 203 km. of standard-gauge line constitute the El Kantara (Suez Canal)—Rafa Railway in the Egyptian territory of Sinai and are the property of the British Government. On the 467 km. of line which make up the two sections of the Hedjaz Railway, situate respectively in Palestine and in Trans-Jordan Mandated Territory, 3 ft. 5½ in. (105 cm.) gauge prevails. These two sections are connected by a link in Syria owned and operated by the Syrian authorities. Separate accounts are kept for the three groups of railways, namely, Palestine, El Kantara—Rafa, and Hedjaz.

Pressure of other work caused by political disturbances delayed the preparation of the report* for the financial year ended March 31, 1936, which we have now received from the Crown Agents for the Colonies on behalf of Mr. C. R. Webb, the General Manager. Referring to the recommendation by Sir Felix Pole of a deviation of the main line so that it might directly serve the large towns of Jaffa and Tel Aviv, the report states that the High Commissioner came to the conclusion that the scheme would not be justified at the present time, as the available funds of the Government were already engaged for expenditure of a more immediately urgent character. Sir Felix Pole's scheme was described and illustrated in THE RAILWAY GAZETTE of April 24, 1936, at page 792. The proposed railway of 18 kilometres from Jaffa to join the main line at Magdiel was estimated to cost £P.504,150. It has been decided, however, to carry out important extensions and improvements to Jaffa and Tel Aviv stations on the basis of certain recommendations made by Sir Felix Pole. No decision had been reached at the end of the year on the proposal to extend the line from Jaffa station to the port. Nearly all the recommendations by Mr. C. M. Jenkin Jones for immediate measures in connection with traffic organisation and methods have either been introduced or are in process of being introduced. Effect has been given to his recommendation that the commercial work of the Traffic Branch should be separated from the operating work, and that a new branch, under a Commercial Manager, should be formed. The report of Messrs. Price, Waterhouse & Company on the financial accounts and on stores organisation and methods is still under consideration.

On the Palestine Railway revenue for the year, which was 2.6 per cent. above that of the previous year, was the largest since 1920, when the railway was taken over by the Civil Administration. This was in spite of a decrease in tourist and other traffic since September, 1935, caused by the Italian-Abyssinian dispute and war. The railway continued to benefit from the temporary diversion of Jaffa cargoes to Haifa during the port improvements at Jaffa. Operating expenses increased principally owing to improvements in pay and conditions of service to the wages staff. The small increase in gross receipts on the El Kantara-Rafah Railway was mainly owing to miscellaneous earnings, as a slight gain on the goods side was almost counterbalanced by a fall on the passenger side. Improved wages and conditions of service were the principal cause of the increase in operating expenses. Im-

* Obtainable from the Crown Agents for the Colonies, 4, Millbank, London, S.W. 1. Price 150 mils (3s.)

provement in the revenue of the Hedjaz Railway was chiefly on the section in Palestine, but there was also an increase on the Trans-Jordan section, traffic on which had been interfered with by floods in the previous year. Concessions to the staff were the principal cause of the increase in working expenses. Working results of the three main sections are compared in the accompanying table:—

	1935-36 £P.	1934-35 £P.	Difference £P.
Palestine Railway:			
Gross receipts ..	588,816	573,614	+15,202
Working expenditure ..	421,822	345,527	+76,295
Net receipts ..	166,994	228,087	-61,093
El Kantara-Rafa Railway:			
Gross receipts ..	119,052	118,495	+557
Working expenditure ..	110,551	104,864	+5,687
Net receipts ..	8,501	13,631	-5,130
Hedjaz Railway:			
Gross receipts ..	102,751	90,545	+12,206
Working expenditure ..	108,252	101,020	+7,232
Net receipts ..	Dr. 5,501	Dr. 10,475	+4,974

Working expenditure of the Palestine Railway included £P.60,000 in 1935-36 and £P.56,700 in 1934-35 for renewals. In addition, sums of £P.123,966 and £P.76,953 in 1935-36 and 1934-35 respectively were expended on extraordinary works, and after charging £P.157,140 in both years in respect of debt charges and sinking funds there was a deficit of £P.114,112 in 1935-36, against £P.6,006 in the previous year. The working expenditure of the El Kantara line includes contributions to its special fund to meet renewals and other extraordinary expenditure. There is no renewals fund for the Hedjaz Railway. The question of improved locomotive water supplies at Haifa and Lydda is still under consideration, but a great improvement in the condition and maintenance of the Haifa engines has been brought about in the meantime by the supply of water by a private company from wells sunk in the Acre Bay. Six 4-6-0 standard-gauge tender locomotives for the main line passenger service, built by the North British Locomotive Co. Ltd., and four new 0-6-0 standard-gauge shunting locomotives from Nasmyth Wilson & Co. Ltd. were put into service during the year. Some 13 km. on the line between Jerusalem and Jaffa were re-sleepered in steel. It is hoped to continue this work by completing the relaying in steel to Jaffa and by working northwards from Lydda to Haifa on the main line.

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Autonomous Burma Railways

ONE of the principal measures provided for in the Government of India, and Government of Burma Acts, 1935, is the separation of Burma from India, and with it the bestowal of autonomy upon the Burma Railways; these changes took effect yesterday, April 1. In our issue of January 19, 1934, we published an editorial outlining the constitution of an authority to control those railways, as it was then proposed for embodiment in the Government of India Bill. Actually the separation of Burma was dealt with in what became the Government of Burma Act, 1935, but in this respect the provisions of the Act appear to be identical with those quoted in our former editorial. Briefly, the executive authority in Burma for the construction, maintenance, and operation of railways is a Railway Board consisting of a President—who, as chief executive officer of the railways, is ex officio—and eight other members. Of the latter, two are official members, one appointed by the Governor of Burma, the other the Secretary to Government in the department controlling railways. The remaining six are non-official members, two of them appointed by the

Governor, and one each by the Burma (European), Burma-Indian, Burmese, and Chinese Chambers of Commerce. The non-official members are appointed for five years and are eligible for re-election, but may at any time be removed from office by the Governor. All members are salaried, and the President, whose official title is Chief Railway Commissioner, has right of access to the Governor.

It is noteworthy also that the board is charged with the primary duty of acting on business principles, and that contracts made by it are enforceable by or against it, and not by or against the Government. The board controls its own finances and funds, and any revenue surplus will be apportioned between the Government and the board by mutual agreement. The Government may, however, provide funds for railway capital or revenue accounts on which interest is payable by the board. The safety of the travelling public and of the railways' servants—including responsibility for holding accident enquiries and, possibly, inspection—is the concern of the Government independent of the board. The rights of all railway staff are assured as servants of the Crown and as hitherto enjoyed. In accordance with section 150 of the Government of Burma Act, the Governor may direct that there shall be a High Commissioner for Burma in the United Kingdom, and he may appoint an individual to hold this office, but for the time being, the High Commissioner for India is, in accordance with Section 322 (3) of the Government of India Act, undertaking the duties of High Commissioner for Burma as well as for India; he is also responsible, through the Indian Stores Department, for business relations between the Burma Railways and firms in this country in the matter of contracts, tenders, &c. Incidentally it may be mentioned that though a new portfolio of Secretary of State for Burma is also to be created, this, for the present, will be held by the Marquis of Zetland in addition to that for India.

Owing to the fact that since the depression began the Burma Railways—a 2,060-mile Government owned and worked system—has been operated at a loss, albeit a much reduced one in 1936-37, India professes relief at being rid of this financial incubus. But previously matters were very different, and the Burma Railways yielded a very good return upon capital. Hundreds of thousands of tons of rice (or paddy) were railed to Rangoon and other ports annually for export, mainly to Germany for the brewing of Lager beer. The commodity is now obtained from nearer sources, and the rice trade of Burma has fallen on evil days. It is, however, already improving again, and will continue to do so with the universal rise in wheat prices, which forces Indians and other impecunious people to fall back on rice as their staple food. The timber traffic of the Burma Railways is also important and it, too, is now recovering from the slump. It was the magnitude of the rice traffic that necessitated the doubling of 200 consecutive miles of the main line, a feature unique in a metre gauge railway.

Other characteristics of the Burma Railways' system are its numerous large bridges, two remarkable hill lines, and the railway equipment of Rangoon for both passenger and goods traffic. Better known even than the great mile-long bridge over the Irrawaddy, completed in 1934, is the Gokteik viaduct, a steel trestle structure spanning a gorge, the bottom of which is over 800 ft. below rail level. Actually the highest trestle measures 350 ft., but it stands on a natural limestone arch or tunnel over the river, so that it appears possible to toss a stone from a train into the stream 830 ft. below. There are also many fine bridges over estuaries and tidal creeks, some having large single or double spans of the Scherzer rolling lift type; rivers, too wide to be bridged, are crossed by wagon ferries in

two places. The Lashio branch constructed about the end of the last century, runs from near Mandalay for about 175 miles up into the hills of the Northern Shan States. It carries a valuable mineral traffic for the Burma Corporation mines, and a considerable passenger traffic to Maymyo, the summer hill-station of Government. But its chief features apart from the Gokteik viaduct are 12 miles of practically continuous 1 in 25 gradient, and a ruling grade of 1 in 40 over much of its remaining length. This line is worked with very powerful 100-ton Beyer-Garratt, and with North British built Mallet compound locomotives. The other hill line is the Southern Shan States branch, opened shortly before the war and about 90 miles in length. As well as rising through 4,000 vertical feet from the plains, it has no fewer than 16 consecutive miles of 1 in 25 gradient and very long stretches of 1 in 40 and 1 in 50 also. Moreover, this branch boasts two complete spiral curves, and like the Lashio line has four reversing stations and is worked with similar articulated locomotives. The engineering works and scenery of both these branches are most striking.

Rangoon, until yesterday the third port in the Indian Empire, has a population now approaching half-a-million, and is served by one main and 22 suburban passenger stations. The main station, which is of the through terminal type, is a fine modern structure, capable of accommodating two main line and ten local trains at a time.

Some 160 trains enter or leave it daily, and between 5 a.m. and 9 p.m. a train arrives or departs on an average every 7 min.; in the busiest hour the average period between trains is only $4\frac{1}{2}$ min. The locals, comprising $\frac{1}{4}$ of the total traffic, are worked by 4-6-4 tank engines, and the Mandalay expresses, which are among the heaviest and fastest metre gauge trains today, are worked by 4-6-2 type locomotives. Goods traffic is dealt with at two main sorting yards, the one at Malagon being very large and worked on the gravity system; main line goods trains are hauled by 2-8-2 and 4-6-0 locomotives. A sturdy 2-6-2 type of tank engine distributes loads and empties to the multitudinous mill sidings and jetties, some of which are capable of berthing vessels ranging up to 12,000-ton liners.

Burma, one of the most colourful countries in the world, is already popular with the tourist and likely to become more so, but its attractions and travelling amenities need to be better known in the West, including America. Combined rail and Irrawaddy Flotilla Company's steamer tours enable one to see most of this, the newest autonomous part of the Empire in comfort. "Jack" Burman, "the Irishman of the East," has greater opportunities, under the new constitution, for governing his country, and he will do well to cultivate a propensity for attracting the tourist to his interesting and artistic land. We wish the railways of Burma success in their autonomy.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Train Numbering

Southern Railway,
Traffic Manager's Office, Operating Department,
Waterloo Station, S.E.1, March 17

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In reference to the observations made by Mr. R. A. H. Weight in his letter published in THE RAILWAY GAZETTE on March 5 as to train numbering on the Southern Railway, it occurs to me that your readers might be interested to know that on busy days the normal head codes which indicate the route and destination of the trains are supplemented by a numbered disc, for example:—

No.	Train	From	Due Waterloo
	a.m.		p.m.
38	9.25	Bournemouth West ..	12.10
39	7.42	Dorchester ..	12.17
40	10.22	Portsmouth Harbour ..	12.31
41	11.47	Woking	12.44
42	10.0	Poole	12.50

This arrangement is introduced so that the station staff may readily identify each train as it approaches, whether it is running out of course or not, and at once "call" its stopping places for the information of passengers waiting on the platform; the signalmen can also identify the train by its number and, by reference to the "Special Traffic Notice," ascertain its subsequent working, which is of special benefit at busy terminal stations.

Yours faithfully,

E. J. MISSENDEN

Welded and Articulated Rolling Stock

Hillview, Hillcrest Road,
Harrogate, March 19

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—I was extremely interested to see in your issue of March 19 a reference to new railway carriages constructed by the L.M.S.R. at Derby in which the employment of

high-tensile steel, electric welding, and articulated bogies has led to a substantial reduction in weight. The striking results obtained are of such interest that your readers may like to know a little more of the history of this form of construction. The first application of welding in railway wagon underframes for service in this country was made by the L.N.E.R. in December, 1932, and has been greatly extended since that date. The first L.N.E.R. wagon to be so constructed was put into service at the beginning of 1933, and is, I understand, giving every satisfaction.

This company was also the pioneer in the welding of carriage underframes; I believe the first coach to be constructed on this principle was an open third class vehicle put into traffic in February, 1934. The principle has been greatly extended since, the L.M.S.R. following the example of its eastern colleague in the matter of carriage underframes in April, 1934, and wagon underframes in July, 1934.

In the matter of articulation of railway coaches, we in the West Riding are very familiar with this principle, as practically all the trains in service on the old Great Northern line of the L.N.E.R. are made up of articulated units. I think I am right in saying that the standardised system on which the articulation of railway carriage units has been carried out throughout the world was first designed and patented by Sir Nigel Gresley (then Chief Mechanical Engineer of the Great Northern Railway) in 1907. It has been successfully applied to hundreds of coaches on that railway, including units on the world renowned Silver Jubilee train.

Yours faithfully,

JAMES SLATER

ISLE OF WIGHT RAILWAY HISTORY.—The Southern Railway Company proposes to issue a book giving a brief history of the railway activities in the Isle of Wight. The company would be grateful, therefore, if anyone having photographs, early press cuttings, or accounts of incidents or anecdotes, particularly prior to the amalgamation of 1923, would lend them to the compiler, Mr. A. B. MacLeod, Room 128, General Offices, Waterloo station, London, S.E.1.

PUBLICATIONS RECEIVED

The War Office at War. By Sir Sam Fay. London: Hutchinson & Co., Paternoster Row, E.C.4. 9½ in. × 6 in. 288 pp.; 16 portraits. Price 18s. net.—On seeing this title, one is moved to ask "At war with whom?" and after reading the book, one may be strongly tempted to answer, "With itself, with other departments, with the Cabinet, and, incidentally, with the enemy"; but this, perhaps, would not be quite fair, for the internecine warfare on the home front, though waged vigorously and incessantly, was but a running and often blasphemous commentary accompanying the strenuous and unremitting effort made to sustain and supply the forces in the field. To the present reviewer, who served under the Director-General of Movements and Railways, and also under the Director of Military Intelligence, during the whole period recorded in this book and beyond, and who was peculiarly placed to appreciate many of these happenings from within as well as with some detachment from outside D.G.M.R., Sir Sam Fay's first-hand account of those two hectic years in the War Office has proved both illuminating and painfully reminiscent of "old unhappy far-off things and battles long ago." Its authentic value as a contemporary document is unquestionable, since the author relies largely upon his diary written up from day to day, and both in these necessarily brief and hasty entries and in his retrospective comments on current events, Sir Sam proves himself a master of terse and pungent statement and of caustic humour, often summing up a complex situation in a pregnant word or phrase.

The book as a whole gives a remarkable cumulative picture of what modern warfare meant in terms of movement, transport, and supplies, and proves conclusively, what is so often overlooked, that all military action is conditioned by transportation. The essence of war is movement, and this is true even and especially of trench war, for only the front lines are stationary and behind them movement is incessant. Railways, roads, waterways, and docks played an immense part in the last war, and may be expected to play an even greater part in any future war, despite air developments. The book also brings out clearly the human interaction between the military mind and civil technicians—in Sir Sam's case, largely owing to his personal qualities, a happy relation. He declined to wear uniform or to assume any military rank, and it is greatly to his credit that, as he made quite clear at the outset, he refused any pay (his salary being paid by the Great Central) and sought no honours of any kind. The personal thanks of the King (and of the Army Council and Commander-in-Chief) were more than sufficient recompense for all that he did—and that, despite this modest and restrained story, was of

incalculable value, as every one in the War Office well knew.

Sir John Cowans, Q.M.G., called him at first a damned fool, and Sir Henry Wilson, C.I.G.S., threatened to shave off his beard and put him into uniform, or, alternatively, to send him to the Admiralty, "where any sort of face was welcome," but he settled down happily amongst the soldiers on terms of mutual respect, and staunchly took their part against the politicians. His fine tribute to Sir William Robertson is a memorable thing, and his defence of the military machine is generous, but its good qualities are not the whole story, and amongst its keenest critics are not only politicians (who with all their ineptitude had sometimes the larger vision) but military men themselves, as witness, *e.g.*, Captain Liddell Hart's "Outline of the War." But this, we fear, is part of the nature of war, and one wonders, perusing this veracious record, why we did not lose the war in the summer of 1918, or how the Allies ever contrived to win it at all, until one reflects that all armies and war offices were, fortunately, much the same, and victory went eventually to those who had the greatest staying power, aided in our case by the "big battalions" massing from America.

Both those who were in touch with D.G.M.R. during the war and the general reader will be interested in the plan of its organisation given here. (Incidentally, the description "technical records" for the branch presided over by the present writer was a camouflage for technical intelligence work done not only for D.G.M.R. and D.M.I., but also for the Admiralty and other departments.) For the first time, the scandalous story of the quarrel over D.G.T. (France) is told fully, and the spectacle of high officers indulging in personal jealousies, petty quarrels, and worse, during the gravest crisis of the war is not reassuring. Though he became an admirer of the military man, Sir Sam was not so favourably impressed on his first contact (when the War Office lost a regiment!) and does not hesitate to criticise examples of ineptitude. He has many shrewd thrusts at his colleagues' weaknesses, and shows how dangerous a personality was that brilliant and erratic Irishman, Sir Henry Wilson. The author tells many good stories and gives some delightful examples of war-time ironic verse—a pity that an anthology of this form of poetry has not been compiled.

Perhaps the most important part of the work is the last chapter, in which Sir Sam Fay puts forward his suggestions for the organisation of transportation in preparation for a future war. Briefly, he recommends that there should be an organisation in being, ready at any time, as the Railway Executive Committee was ready in July, 1914, to function upon the declaration

of a Precautionary period. It cannot be expected that the army should in time of peace be possessed of railway, road, dock, and canal officers and men capable of taking hold of an organisation such as existed at the close of 1918; nor would it be economical or practicable to have such a permanent staff. Civil transport should therefore form the nucleus of such a structure.

These representatives, gathered together as an advisory committee, should select office accommodation, prepare all necessary regulations for rank and file, schedule, in conjunction with the various departments of the War Office and the Railway Executive Committee, probable requirements in the shape of rolling stock, rails and sleepers, road-making machinery, cranes and dock equipment, and ascertain where and how these essentials could be obtained at short notice. They should keep in touch with the Admiralty and Air Force upon questions of shipping and the method of requisition for troops, stores, and hospital ships. Given a permanent organisation (not a mere paper one that would lend itself to a sense of false security) such as this, fully advised of possible theatres of operations, watching changes in warfare and their effect upon transport, especially in relation to speed and road services, the national effort upon a declaration of war should not suffer by reason of inefficiency in transport.

The duties and responsibilities of a Director-General of Transport in the field should be clearly defined, and he should, without doubt, be directly responsible to the Commander-in-Chief. At the War Office, a civilian Director-General of Movements and Railways (with a military deputy), directly responsible to the Secretary of State, with appropriate directorates acting in close co-operation with the Admiralty, the Shipping Controller, the Air Force and other Government departments, should be appointed, who should have a seat on the Army Council as the representative of transport both home and overseas.—W.E.S.

[We comment on this in an editorial article.—Ed. R. G.]

London Transport Leaflets.—Two illustrated leaflets published by London Transport will be of particular interest to visitors to the capital at the Coronation season. With this in view, one of the leaflets is printed in four languages, and lists several sightseeing tours by motorcoach covering the City, West End and East End, Dockland, Windsor, and Hampton Court. The tours in London are being run every weekday from March 25. The other leaflet shows the principal cheap fare facilities from Underground stations to country and seaside. Both are illustrated with glimpses of London scenery and life—in the metropolis itself and in that variegated countryside which is brought so closely into touch with it by the services of the board. The leaflets possess a touch of originality in their production which is likely to cause them to be studied with attention and profit.

THE SCRAP HEAP

Some Extracts from Sir Sam Fay's War Transportation Diary*

We devote our Scrap Heap page, this week to a few typical extracts, out of many hundreds equally interesting, from Sir Sam Fay's instructive and entertaining book, "THE WAR OFFICE AT WAR," reviewed on the previous page and also discussed in one of our editorial articles

January 6, 1917.—Sir Guy Granet asked me if I was prepared to take over the Directorate of Movements at the War Office in the event of a change in the direction being made.

January 7, 1917.—Saw Lord Derby at 11 a.m. with Geddes and Granet. Lord Derby said he was very glad I had agreed to take position of Director of Movements. That the position would be independent of Quartermaster-General under whom the Directorate of Movements was at present. Q.M.G. (General Cowans) called in and position explained to him. He was evidently none too pleased, and said it would be difficult in some directions by reason of the necessary inter-communication between the various branches of the War Office. The change to take place at the end of a week when Major-General Richard Stuart Wortley, Director of Movements, would take three weeks' holiday, but would be available, i.e., at my call for one week. A military deputy to myself to be appointed and Ryley of the Adjutant-General's Department was recommended by Cowans. As we left Lord Derby rang the bell for General Stuart Wortley, remarking: "Now my most unpleasant duty begins."

Geddes told me later that Lord Derby said if any difficulty with military officers I should be made full general. I said I desired no military rank.

When I saw General Cowans the next morning he was angry and called me a damn fool. He said I could not carry on the job, that it was a military post, and the tentacles of the Director of Movements were all over the War Office and could not be moved from the building, although they were overcrowded. He appeared to think a move would be made to the Hotel Cecil. He reminded me that he had held the position ten years before Stuart Wortley, and knew something about it.

Explaining how I came into the picture I told him I was there to try and be helpful, and with goodwill all round I hoped to pull through. At the end of a long discussion he said: "Well, I will help you all I can, but I do not know what they are up to. It is all wrong."

January 14, 1917, Sunday.—At War Office all day getting through back papers and considering organisation. Left at 9 o'clock.

January 15, 1917.—War Office all day. Went back after dinner and worked until 12.10 midnight.

January 19, 1917.—The Prime Minister sent for me at 11 a.m. and I went over to Downing Street. The War Council had just risen. Met Sir William Robertson, Chief of the Imperial General Staff, coming out, had a word or two with him. A large meeting of some sort had just assembled and Major Hankey, the P.M.'s Military Secretary, said Lloyd George could not come out, but had told him what to tell me. He wanted a first-class railway man to go to Russia in three or four days' time with a Military and Diplomatic Mission, to study Russian railways and advise; the idea being that he should remain there with a view of running railways which are badly managed and full of corruption, material having been handed over to enemy and other irregularities occurring. Maybe hold on to railways after war. I said rather tall order to give opinion at minute's notice on such an appointment. After consideration I said I thought George Bury, Vice-President Canadian Pacific Company, best man; then Thornton, General Manager Great Eastern Railway, might do it. Failing him, Aldington, Superintendent of Line, Great Western, was a good railway man, but neither of last two equal to Bury for such a job. He, I thought, had just left England for Canada but would find out. I returned to office after telephoning C.P.R. European Agent (McLaren Brown). Found Bury ought now to be in Montreal. Returned to Downing Street and told Hankey. Saw McLaren Brown later; found P.M. had requested him to cable Shaughnessy, President C.P.R., for Bury to return next ship.

October 2, 1917.—Crossed Folkestone to Boulogne with Nash and Grey, latter officer in charge of Line of Communications, Cherbourg - Taranto. Motored from Boulogne to Monthuit, G.H.Q. of Transport. Hour's run. Quarters in charming old French chateau in middle of park. Very comfortable. Half-dozen generals who run Transport living there in every comfort as to attendance and food.

October 26, 1917.—Started at 10 o'clock with Wedgwood for Calais. Inspected docks, afterwards went to Vendroux, on canal where there is a very large depot. German prisoners and Chinese at work doing well. Chinese at docks are excellent when properly used. They cannot stand in-

tensive bombing. At Dunkirk they fell into a panic when bombed from the air; some ran into the water, some climbed trees, others fled into the country and crouched in the cottages to the alarm of the peasants. We have about sixty thousand of them in France altogether.

Got back to Monthuis late after calling on Cecil Paget, Lieutenant-Colonel, formerly Superintendent of Midland Railway, in charge of Railway Operations Division. Cooks his own food. Had course of cooking in Midland Hotels. Clever.

Cecil Paget, Railway Operating Division, acted as the equivalent of a superintendent of the line in conjunction with the French railway officers, with whom he was always upon the best terms. The swinging of battalions or divisions from point to point under this combination was a subject of general admiration. He could have been graded as a general if he had so wished. He was more intent upon his duties than upon advance in military rank.

October 28, 1917.—Motored to Boesinghe at the back of Pilkem Ridge. Heavy fighting going on north-west of Holthurst Wood. Gun-fire terrific. Went through our heavy batteries. Told to watch batteries and keep fingers in ears. Quite all right until 15-in. camouflaged howitzer, which I did not see, let go behind me. Thought head off. We took out our helmets and had a bag with our gas-masks, but did not have to use latter.

November 27, 1917.—Italian situation a little bit better. Trains getting through via Nice fairly well.

Meeting with Port of London Authority as to charges. They agreed to give up about £5,000, but we want more than that. The Manchester Docks appear to have overcharged by about £10,000.

Granet tells me there is idea of Geddes leaving Admiralty and going to Paris on the Allied War Council to co-ordinate transportation.

November 28, 1917.—Robinson, Great Central Engineer, came up last night about threat of shopmen at Manchester G.C.R. to strike on Friday over 12½ per cent. increase given time workers by munition people. Meanwhile, negotiations are going on with National Union of Railwaymen for increase of 10 per cent.—10s.—war wage. Altogether, it is an awful muddle, and there is likely to be serious trouble all over the country in a week or two.

Attended Railway Executive Meeting. It appears War Cabinet met last night 9 p.m. and decided that Executive should settle with N.U.R. for 6s. increase. This will probably be accepted because it will enable the Union to score off the Enginemens' Union who have got only 5s. on an award by the Committee on Production. Another muddle!

* "The War Office at War," by Sir Sam Fay, Hutchinson & Co. (Publishers) Ltd., London, 18s. net.

February 17, 1918.—Papers announce resignation of Robertson as C.I.G.S. and Wilson to take his place. A nice state of affairs at the supreme crisis of the war!

February 21, 1918.—Meeting in D.C.I.G.S. room. Wilson in chair. Discussed question of sending divisions to Egypt. He did not impress me favourably. A very different type to Robertson. The latter is a strong man whose wish is acted upon by everybody without question at once. He knows his strength and doesn't abuse it. He goes straight on to the end of a move once decided upon. Wilson reported to be a trimmer to every political wind that blows. Not much of a help in these critical times.

May 9, 1918.—M.M. meeting. Nothing doing. The clear-out of Robertson, Whigham and Maurice, together with Derby going, has demoralised the whole show. Nobody cares to discuss anything, and the new D.C.I.G.S. and D.M.O. have not got into their stride.

May 14, 1918.—Because we have not enough side-shows a new one is being started in Northern Russia. Troops and transport officers and personnel are to be sent to Murmansk, together with railway material.

June 17, 1918.—Nash came over. Discussed evacuation with him.

June 18, 1918.—Saw Maclay as to proposed evacuation of stores in France and establishment of bases in England.

July 7, 1918. Sunday.—To Poole and decided upon layout of wharves and sidings. To Keyhaven in afternoon. Inspected site in view of possible loss of Straits of Dover and consequent inability, so Admiralty say, to use Newhaven, Poole and Southampton Town Quay will take care of Thames and Richborough barges, but Newhaven with its 50,000 tons a week must find a home elsewhere. Southampton must give up long sea voyage and other work to make room for Western Front troop movements, including hospital ships. Western ports will have to take care of remainder. What a prospect!

July 25, 1918.—Nash is over with a request on Italian wagon supply, and has arranged to get it before War Cabinet to-night at 5 o'clock. Attended it. L. G. only minister present. Stanley, Walker, Calthrop and Maclay there. Agreed to send 10,000 English wagons to France, the latter to supply Italy.

July 16, 1918.—Motored to Dover and caught leave boat. Motored Calais to Monthuis.

July 18, 1918.—Saw Sir Douglas Haig and gave him scheme of organisation. With Scotch caution, he neither approved nor disapproved, was very complimentary on what railway men had done for him. Thought Army Council did not recognise what we had

done. Pressed me to stay on. Asked me to dine with him to-night.

The impression left upon my mind as to transportation matters was that the R.E. officers, admirable as they proved to be in engineering work, were afraid of responsibility in big things connected with movement, which is outside their province and foreign to their training.

November 8, 1918.—Very busy all day on reduction of stores questions. Decided to go to France G.H.Q. and on to Paris on Friday next.

November 9, 1918.—Telephone from France that German plenipotentiaries had arrived to discuss terms of armistice. Only complaint they made was that the butter supplied them was not good.

November 11, 1918.—10 o'clock. Bells at churches ringing for signing of armistice.

At War Office, evident little work was to be done today. At 11 o'clock assembled in C.I.G.S.'s room. With Army Council to Buckingham Palace to congratulate King on victory. After signing our names in visitors' book went to King and Queen in large dining room looking over balcony at front of palace. The King made quite a good speech, thanking all for what we had done.

December 3, 1918.—Attended Railway Executive meeting. Labour questions to front.

Meeting with Winston Churchill at Ministry of Munitions. He wants to order 2,000 engines and 50,000 wagons to keep labour going. Wanted us to tell him what class of engines to order. No liability to rest with railway companies.

December 4, 1918.—Meeting Railway Executive to discuss Churchill's problem. Locomotive engineers, as usual, all sparring for their own designs without reference to what we were asked to do. Adjourned till tomorrow.

January 16, 1919.—I sent a formal letter to Churchill, saying:

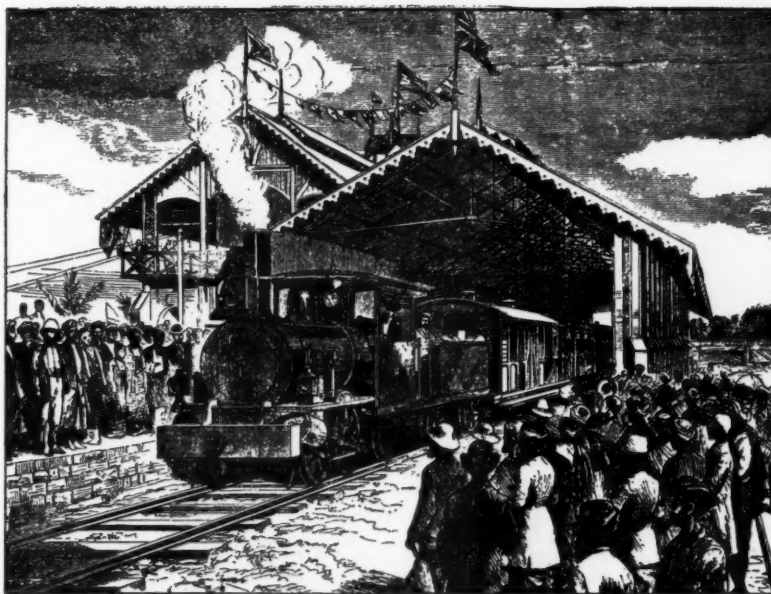
"The time has come when I must return to my railway business and the Railway Executive Committee. I have been at the War Office for over two years, and my company is asking for my return."

March 4, 1919.—Railway Executive on Geddes Bill for taking over railways. Long discussion, but nothing very definite. Meeting in afternoon Railway Association. Chairmen of Railways talked rot; some for downing Bill, others for accepting it anyhow, on ground that if left over might get something worse. On to Whitehall Gardens where we met Geddes and Short, Home Secretary, in charge of bill. Butterworth and Andrews, both lawyers, spoke for Association.

March 24 to 26, 1919.—Routine. I'm getting fairly fed up with the War Office. It gets worse and worse.

The fact was I had become tired, bad tempered, and out of my usual health.

I wrote a note to Wilson telling him he would not be disturbed in future by seeing my bearded face enter his room. He had in facetious mood told me, more than once, that a beard was not to be tolerated in the War Office, that he would put me into uniform, and have me properly shaved or, as an alternative, send me over to the Admiralty where any sort of face was welcome.



The first train leaving Rangoon station, May 1, 1877. The segregation of the Burma Railways from India is dealt with in an editorial on page 645

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

NEW ZEALAND

Improved Engine Cleaning

The development of mechanical locomotive cleaning was the subject of a paper given to the Science Congress at Auckland by Mr. L. W. Robertson, Locomotive Engineer, North Island Main Line and Branches, Auckland, and by Mr. G. S. J. Read, Assistant Locomotive Engineer, N.Z.G.R. The paper explained that, prior to 1935, practically all engine cleaning was carried out by hand wiping, but this had since been practically eliminated on grounds of economy during the depression. After a large number of experiments had been made, a "pressure step-up" injector was developed, capable of delivering a stream of very hot water at 400 lb. per sq. in. pressure. Special appliances for safety with such a cleaning jet had also been developed, and this method removed heavy accumulations of grease, chiselling and melting them away as quickly as the jet was played on the different parts of an engine. At an early stage of the experiments, the best cleaning plant from America was imported, but the local equipment, it was found, produced a much better finish in quicker time. There was also the advantage that the equipment could be used wherever a locomotive was standing in the shed, instead of the engines having to be moved to the plant.

Wellington New Station

The new station at Wellington was partly occupied in December last by the staff of the District Traffic Manager. The move had to be made to enable the old district offices to be pulled down for completing the approaches to the new station. The new offices are practical, tasteful, and adequate for years to come. For instance, the room of the District Traffic Manager is spacious and suitable for the occasional reception of delegations. The lighting is a special feature; the windows take up most of the outer wall space, and, as throughout the building, the metal frames have a lazy-tongs fitting enabling them to be adjusted to any degree of opening required without rattle or danger of slamming shut. Electric lighting takes the form of a white opal bowl, and a wainscot of dark rimu encloses the heating plant; in an angle there is a wash basin in an unobtrusive panelled recess. It is anticipated that the new station will be formally opened in April.

Miscellaneous Items

Among the more important works in this year's programme, is the regrading of the Auckland northern suburban line, which is being carried out in conjunction with the elimination of two busy level crossings. The needs of

the public require an intense and fast traffic which is difficult of attainment with existing sharp curves and 1 in 40 gradients. The future ruling gradient will be 1 in 60, and the new works will stretch practically from New Lynn to the Waitakeres.

A 70-ft. turntable, the largest in the South Island, has just been built at the Hillside (Dunedin) workshops. This 20-ton table is for Arthur's Pass, and is required to meet the need for longer and heavier locomotives on the Midland route between the east and west coasts.

INDIA

1937-38 Budget. Open Line Works

In addition to the two new lines to be constructed in Sind [see page 478 in our issue of March 12—Ed. R.G.] the policy of strengthening and improving track and bridges, where still necessary, is being continued. A sum of Rs. 436.02 lakhs (£3½ million) is provided for track renewals during 1937-38, and the provision for girder renewal and bridge strengthening amounts to Rs. 70.22 lakhs. The Meghna bridge on the Assam-Bengal Railway is expected to be completed in the current financial year. Other important bridge works include the re-girding of the Nerbudda bridge at Mortakka on the B.B. & C.I.R. at an estimated cost of Rs. 25 lakhs (£187,000), of which Rs. 7 lakhs will be spent in 1937-38. The existing girders of this bridge are in poor condition, and, as all other bridges on this section have been renewed up to H.M. standard, it is considered desirable to bring this one also up to that standard so that speed restrictions may be removed. On the Moghalsarai—Allahabad section of the East Indian Railway, there are several bridges the arches of which are not strong enough to take modern loads. A scheme, estimated to cost Rs. 10 lakhs, has been prepared to provide relieving girders on these weak arches. The work will be begun in 1937-38. It is moreover, proposed to renew the Victoria bridge over the River Jhelum on the Malakwal—Kundian section of the North Western Railway.

Modernisation of Stations, Signalling and Workshops

A beginning will also be made in 1937-38 with the replacement of obsolete signalling at several stations on the Assam-Bengal Railway. On the same railway, a sum of Rs. 2.35 lakhs has been provided for interlocking and remodelling Lumding and Badarpur stations. A sum of Rs. 2.62 lakhs has been provided for remodelling the traffic and locomotive yards at Waltair on the Bengal-Nagpur Railway, and provision is made for building a new station at Cuttack if it becomes the

capital town of the new province of Orissa. Funds are provided for the remodelling of Coimbatore station on the South Indian Railway, the first stage of which is expected to be completed in 1938-39. A beginning will also be made with the second stage of the work, estimated to cost Rs. 15 lakhs, which will improve the railway position of Coimbatore in consonance with its industrial importance, by placing it on the broad-gauge main line and giving it a direct metre-gauge connection with Pollachi and beyond. Funds are also allotted for continuing the remodelling of the Jamalpur workshops of the E.I.R. and for providing new machinery in the B.B. & C.I.R. workshops at Ajmer and Parel. Considerable expenditure will also be incurred on the construction of staff quarters and for the provision of amenities for passengers.

Mechanical Engineering Programme

Under rolling stock a sum of Rs. 71.16 lakhs is provided for the completion of works sanctioned in previous programmes. The expenditure on new items is estimated to amount to Rs. 234.15 lakhs (£18 million). The programme for locomotives includes the construction of 24 broad-, 10 metre- and 3 narrow-gauge engines. Under coaching stock it is intended to build 345 broad-, 307 metre- and 38 narrow-gauge vehicles of various classes. Provision is also made for obtaining 2,000 broad- and 636 metre-gauge general service wagons, in addition to 223 other type wagons of different gauges.

IRISH FREE STATE

Changes Consequent on Closing Broadstone Station

As announced in THE RAILWAY GAZETTE of January 22, Broadstone station was closed on January 18. The arrangements for working the trains to and from Westland Row station have proved very satisfactory; the running of the trains from and to Dun Laoghaire pier has added to efficiency; and, except when the mail boat is more than 40 minutes late, the train for the west of Ireland has left Westland Row to time.

Amiens Street (Great Southern Railways), the junction for the Great Northern Railway, was originally considered as a terminus for the western trains, but it was found to be unsuitable. It is situated at a level above the roadway, and is approached by a narrow courtyard leading to stone steps, which in turn give access to steep and narrow curved passages, so that it would be difficult to convey luggage from the street to the station. There are three platforms, but on only one are there booking offices, waiting room and lavatory and cloakroom accommodation; in addition, this is the only platform of sufficient length for the Midland Section trains. There is

no accommodation for the storing of carriages owing to the frequent suburban service, which runs at 15-min. intervals during the summer. Furthermore, the Drumm train charging station is situated on this platform.

Lately, in response to public demand, it was arranged that incoming trains from the west should stop at Amiens Street, but now a further demand has arisen to have the outgoing trains stopped there also. It has not been found feasible to agree to this request owing to the construction of the station, not to mention the extra delay that would occur to trains, which already take 10 min. longer on the journey than in the case of Broadstone.

SOUTH AFRICA

S.A.R.H. & A. Budget

Introducing his railways, harbours and air budget on March 15, Mr. Pirow, Minister for Railways, declared a surplus for the past year of £1,873,180, a sum that would, he said, be passed on to the public in the form of reduced rates and fares and other concessions.

In the forthcoming year the surplus expected would be only about £6,000, as in addition to reduction in port dues, and coal export rates, freights on petrol would probably be about £1,000,000 lower, owing to the lower rates charged.

DENMARK & GERMANY

Winter Weather Dislocates Traffic

Heavy snowstorms in Jutland, and ice in the waters traversed by the train ferry services, caused considerable dislocation to traffic on the Danish State Railways between January 16 and February 5. The worst conditions were reached on January 19 and 20, when most sections of line in Jutland were without train services, in spite of numerous snow ploughs and gangs of men being at work, while on the few remaining sections a skeleton service was maintained only with the greatest difficulty. All express railcar services had to be suspended. The snow was frequently many feet deep for miles at a stretch, and several trains were imprisoned in the drifts. The snow storms abated somewhat on January 21 and permitted of a clearance of the lines, so that normal services were restored three days later.

On January 26, however, ice troubles occurred on the ferry routes between Oddesund South and North, Glyngöre, and Nyköbing Mors, and these combined with very low water, caused the Oddesund service to be suspended for 4 days. On February 1 the trouble had spread and the Helsingör-Helsingborg ferry service was closed, and, although an ice-breaker was introduced, through running from Copenhagen to Sweden and Norway was impossible. The greatest dislocation was, however,

caused by ice in the Great Belt, between Korsör and Nyborg, large quantities having been driven in by easterly winds. The vessels had great difficulty in making harbour. From January 29 many of the sleeping cars and all other through vehicles between Copenhagen and Jutland were withdrawn. The sea passage occupied 16 hr. in one case, against the normal 1½ hr., and passengers had to transfer from one ferry to another, the *Korsör* remaining imprisoned by the ice for 36 hr. In spite of attempts to break up the ice, the position grew worse and the service was completely suspended during the nights of February 1 and 2. On the latter day, however, a warmer wind set in, the service was resumed, and most goods services also were re-established. Some 500 vehicles had accumulated on both sides of the Belt and these were dealt with in order of urgency, no sleeping cars or railcars being ferried over until February 4. Two days later completely normal services were restored.

Sassnitz-Trällebörg Train Ferries Blocked by Ice

In *Die Reichsbahn* Herr Krethlow describes the difficulties encountered in operating the Sassnitz-Trällebörg train ferries during the severe weather this last January. This 67-miles sea ferry service was opened in 1909, and great credit is due to those responsible that, in the face of every obstacle, it has been completely suspended for a total period of only 14 days in the subsequent 28 years. The first occasion was in 1924, when two of the ferries were imprisoned in the ice, and although freed by a German warship, were unable to resume service as the fairway had become so blocked that the Stockholm ice breaker could not open it up. The route was closed for 7 days. It had again to be closed for the same period in 1929, when the German vessel *Preussen* took 42 hours to make the passage, and ice accumulated to a similar extent.

Very bad weather has once more been experienced this year, with heavy storms approaching hurricane force followed by intense cold. The *Preussen* was imprisoned in the ice for 86 hours, but the Swedish ferries *Drottning Victoria* and *Konung Gustav V.*, though experiencing great difficulties in moving, were, thanks to a difference in construction, able to free themselves in a manner impossible for the German vessel. They were delayed for many hours, but succeeded in maintaining a restricted service. Coal on the *Preussen*, which was lying 1½ miles from Sassnitz, ran so low that 50 men were sent out across the ice to transfer a supply from the *Drottning Victoria*, which then resumed the journey to Trällebörg. So firmly was the *Preussen* held by the ice that it needed all its efforts for 11 hours, aided by the ice-breaker *Starke*, to release it. Fortunately it had only goods wagons on board.

KENYA & UGANDA

Railways and Harbour Traffic in 1936

The Kenya and Uganda Railways and Harbours administration reports the following movement of traffic during 1936, as compared with the previous year:—

	1935 Tons	1936 Tons	Increase Tons	Per cent.
Total import traffic railed from Kilindi	92,703	125,797	33,094	35.7
Total export traffic railed to coast	356,482	435,306	78,824	22.1
Total traffic handled	833,518	921,396	87,878	10.5
Total train-mileage	2,196,401	2,456,713	260,312	11.9

MADAGASCAR

The Fianarantsoa-Mankara Railway

The Fianarantsoa—Mankara Railway in this island was briefly described in *THE RAILWAY GAZETTE* of August 2, 1935, and an account of its opening appeared in the May 15, 1936, issue; the following are some further details of this interesting line, which is also illustrated on pages 664-5.

Difficult construction work was entailed in the building of this railway even though 3 per cent. (1 in 33.3) grades and curves as sharp as 260 ft. radius are freely used. The steepest gradient is actually 3.6 per cent. (1 in 28). Owing to transport difficulties, local stone and concrete were used almost entirely instead of girders for bridging, and wherever possible to form arches. Bridge piers are generally stone faced and concrete hearted, and the arching is left unfaced and rough. Concrete slab or girder work is also used extensively. Where larger spans are required these are in the form of concrete bow-string girders or concrete arches. Specimens of these various types of bridge or viaduct are illustrated.

Permanent Way and Stations

The permanent way is composed of 60-lb. f.b. rails laid mainly on steel sleepers, but local hard-wood sleepers are also used where these are easily obtainable; ballast is of stone. Stations are on the average five miles apart, and all wayside stations are of a uniform type; the lower floor is in stone and the upper in concrete. The two terminal stations are, however, much more elaborate, as one of the illustrations shows.

Rolling Stock

At present small steam locomotives capable of taking about 100 tons up the 1 in 28.33 gradients are in use, but the intention is to replace them by diesel-electric locomotives for goods working, and to run diesel-electric railcars and trailers to cater for all passenger traffic.

BRITISH RAILWAY STATISTICS

"The Railway Gazette" monthly table for Dec., 1936, as compared with Dec., 1935, compiled from the Ministry of Transport Statement No. 205

Description	Great Britain*	G.W.R.	L.N.E.R.	L.M.S.R.	S.R.
PASSENGER TRAIN TRAFFIC—					
Number of pass. journeys (ex. season ticket holders)	109,003,434	7,769,315	15,271,326	24,306,396	18,697,339
Increase (+) or decrease (—)	+ 4,871,184	+ 230,328	+ 493,587	+ 1,003,559	+ 927,447
Passenger receipts (excluding season ticket holders)	£4,462,645	£633,012	£902,522	£1,316,279	£977,796
Increase (+) or decrease (—)	+ £270,146	+ £33,618	+ £64,152	+ £69,235	+ £73,132
Season ticket receipts	£774,471	£41,704	£126,035	£175,382	£289,824
Increase (+) or decrease (—)	— £4,650	— £1,801	— £602	— £7,909	+ £12,136
Parcels and misc. traffic receipts (excluding parcels post)	£1,106,135	£201,495	£320,029	£433,108	£128,391
Increase (+) or decrease (—)	+ £50,725	+ £6,720	+ £15,653	+ £23,342	+ £28,111
FREIGHT TRAIN TRAFFIC—					
Freight traffic (tons) (excluding free-hauled)	23,161,551	5,278,441	10,637,268	10,755,482	1,309,537
Increase (+) or decrease (—)	+ 1,267,414	+ 326,755	+ 443,083	+ 345,660	+ 33,085
Net ton-miles (excluding free-hauled)	1,336,227,600	241,428,319	457,030,180	551,126,168	50,467,693
Increase (+) or decrease (—)	+ 96,528,023	+ 19,183,429	+ 34,614,227	+ 40,351,331	— 71,518
Average length of haul (miles) (excluding free-hauled)	57.69	45.74	42.96	51.24	38.54
Increase (+) or decrease (—)	+ 1.07	+ 0.86	+ 1.52	+ 2.17	— 1.05
Freight traffic receipts	£7,119,674	£1,223,300	£2,257,200	£3,054,000	£361,693
Increase (+) or decrease (—)	+ £318,644	+ £81,300	+ £50,353	+ £204,000	£22,625
Receipts per ton-mile	1.279d.	1.22d.	1.19d.	1.33d.	1.72d.
Increase (+) or decrease (—)	— 0.038d.	— 0.02d.	— 0.07d.	— 0.01d.	+ 0.11d.
Freight train-loads: Average train-load (tons)	133.53	139.47	140.20	131.01	103.96
Increase (+) or decrease (—)	+ 0.96	+ 1.76	+ 1.70	— 0.04	— 0.74
Net ton-miles—					
Per train engine-hour	874.08	947.65	982.96	787.71	779.18
Increase (+) or decrease (—)	— 16.60	— 4.38	+ 9.31	— 44.71	+ 22.49
Per shunting-hour	863.07	814.18	986.26	847.44	551.54
Per total engine-hour	434.27	437.93	492.30	408.24	322.94
Net ton-miles per route-mile per working day	3,179	3,058	3,450	3,783	1,188
Increase (+) or decrease (—)	+ 229	+ 223	+ 255	+ 280	+ 16
Wagon miles. Total	365,599,936	64,992,072	127,383,105	154,438,912	16,799,683
Increase (+) or decrease (—)	+ 22,379,668	+ 4,020,025	+ 7,456,757	+ 10,224,523	+ 606,875
Percentage of loaded to total	67.73	68.39	65.35	69.56	66.56
Wagons per train. Total	34.65	35.17	35.12	34.47	32.32
Increase (+) or decrease (—)	— 0.08	+ 0.04	— 0.09	— 0.26	+ 0.77
Loaded ..	23.47	24.05	22.95	23.98	21.51
Empty ..	11.18	11.12	12.17	10.49	10.81
Train miles. Coaching—Per train-hour	14.91	13.84	14.16	14.00	17.74
Per engine-hour	11.87	10.94	10.87	10.66	14.59
Train miles. Freight—Per train-hour	7.66	8.22	8.23	6.93	9.32
Per engine-hour	3.25	3.16	3.55	3.12	3.07
Engine miles. Total	46,232,671	7,296,372	12,792,053	17,376,871	5,905,535
Increase (+) or decrease (—)	+ 1,456,961	+ 216,811	+ 401,765	+ 725,301	+ 49,365
Mileage run by engines. Total train-miles—					
Coaching ..	22,212,267	3,078,269	5,086,903	7,080,912	4,344,524
Freight ..	10,552,603	1,847,847	3,626,846	4,480,223	519,867
Engine-hours in traffic. Total	5,311,553	892,146	1,559,465	2,179,534	484,669
Increase (+) or decrease (—)	+ 209,059	+ 29,150	+ 50,774	+ 133,061	— 8,032
Shunting miles per 100 train-miles—					
Coaching ..	7.78	7.33	6.90	8.36	8.79
Freight ..	76.95	85.45	69.92	75.68	99.12

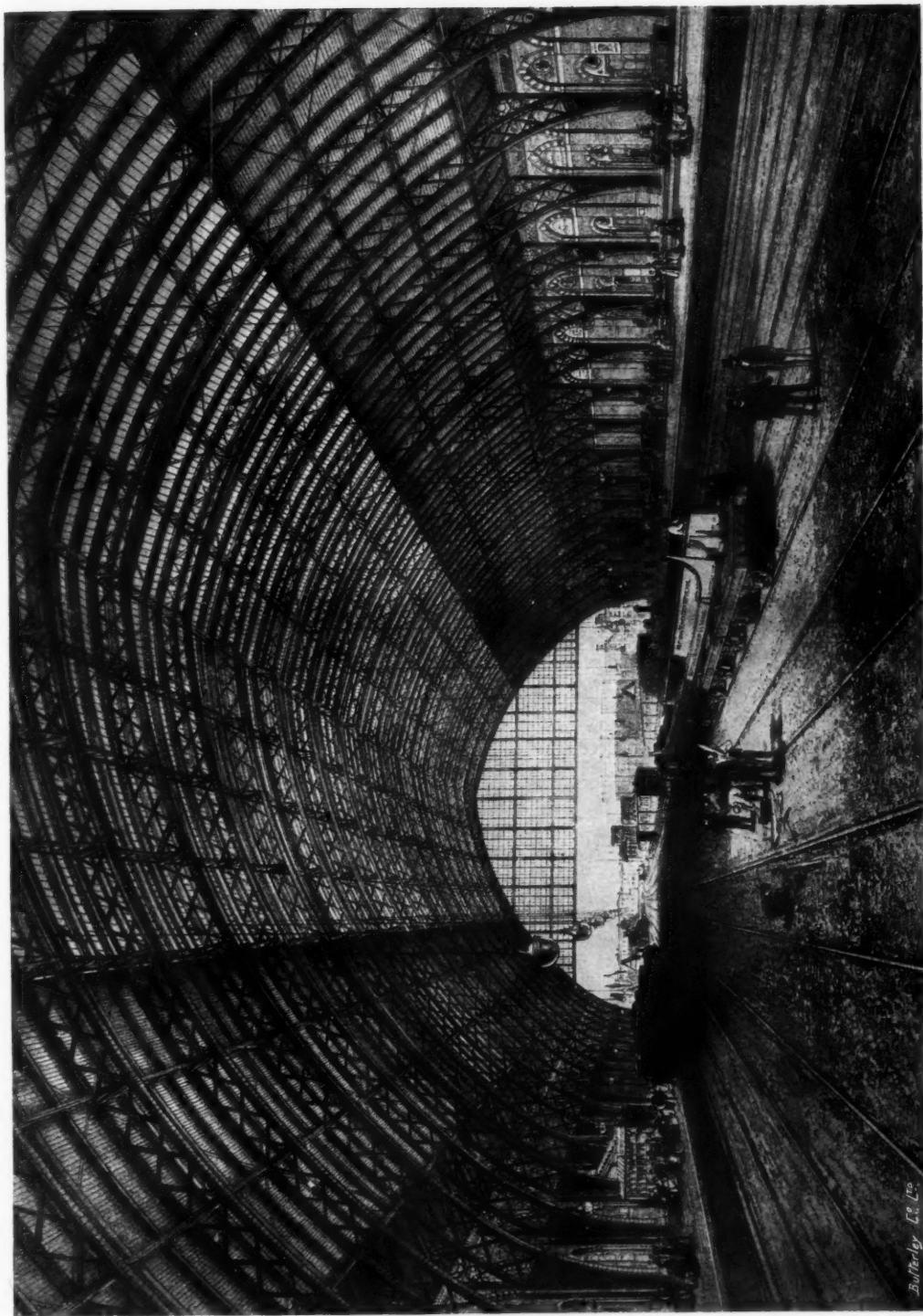
Passenger Traffic Statistics: Number of journeys, receipts, and receipts per journey (excluding season ticket holders)—December, 1936

Subject	Great Britain	G.W.R.	L.N.E.R.	L.M.S.R.	S.R.	Cheshire Lines	Liverpool Overhead	L.P.T.B.†	Mersey
Full fares—									
Pass. journeys ..	36,373,595	735,598	1,226,077	1,568,558	3,069,002	15,476	189,554	28,622,958	97,798
Gross receipts ..	£934,767	£75,666	£127,176	£122,143	£197,028	£2,379	£1,870	£390,854	£1,731
Receipts per pass. journey	6.17d.	24.69d.	24.89d.	18.69d.	15.41d.	36.89d.	2.37d.	3.28d.	4.25d.
Reduced fares—									
Excursion and week-end—									
pass. journeys ..	41,591,776	4,661,663	9,422,106	14,420,120	9,091,768	464,034	69,389	1,510,131	767,940
Gross receipts ..	£2,699,585	£450,009	£622,123	£952,532	£564,570	£24,542	£590	£32,696	£10,897
Receipts per pass. journey	15.58d.	23.17d.	15.85d.	15.85d.	14.90d.	12.69d.	2.04d.	5.20d.	3.41d.
Workmen—									
Pass. journeys ..	26,994,457	1,846,402	3,630,889	7,184,928	5,727,082	259,666	243,004	6,966,946	242,362
Gross receipts ..	£396,320	£27,330	£59,507	£116,299	£95,452	£4,356	£1,959	£78,468	£2,138
Receipts per pass. journey	3.52d.	3.55d.	3.93d.	3.88d.	4.00d.	4.03d.	1.93d.	2.70d.	2.12d.
Other—									
Pass. journeys ..	4,036,593	524,076	990,801	1,129,754	808,589	29,110	51,036	414,465	13,542
Gross receipts ..	£423,390	£78,083	£91,813	£121,424	£119,915	£2,820	£331	£3,433	£183
Receipts per pass. journey	25.17d.	35.76d.	22.24d.	25.79d.	35.59d.	23.25d.	1.56d.	1.99d.	3.24d.
Total—									
pass. journeys ..	109,003,434	7,769,315	15,271,326	24,306,396	18,697,339	768,312	552,983	37,514,500	1,121,642
Gross receipts ..	£4,462,645	£633,012	£902,522	£1,316,279	£977,796	£34,119	£4,750	£505,451	£14,949
Receipts per pass. journey	9.83d.	19.55d.	14.18d.	13.00d.	12.55d.	10.66d.	2.06d.	3.23d.	3.20d.

* All standard gauge railways

† Includes passengers originating on the railway undertakings, and on the Whitechapel and Bow Joint Railway

St. Pancras Station, London



In view of the impending rebuilding of Euston station, the main-line termini of London have recently formed the subject of many articles in both the architectural and popular press. Notable among these structures is the St. Pancras station of the old Midland Railway, which was opened on October 1, 1868. We are indebted to the Butterley Co. Ltd. for this early illustration of St. Pancras station roof, which was manufactured and erected by that company in 1867. The structure comprises a 240-ft. arch, unhampered by intermediate supports, with the ties running underneath the platforms and rails; at the time of its erection a contemporary account said "in the results we have an arch, not only of extraordinary lightness, but of equally extraordinary strength and economy." (See editorial note on page 642)

Butterley Co. Ltd.

WATER TREATMENT ON THE TRANS-AUSTRALIAN RAILWAY

Successful application to locomotive water of a new system previously restricted to stationary boiler supplies



THIS year the Trans-Australian Railway will celebrate the 20th anniversary of its opening, and the occasion will be marked by the introduction of a faster service, making it possible to travel from Perth to Sydney—a distance of 2,759 miles—in three business days, or a day less than hitherto. According to a statement received from the Commonwealth Commissioner of Railways, one of the remarkable achievements of this system is its solution of the water problem, which during the construction of the railway and for several years afterwards was so grave that on several occasions a cessation of traffic appeared imminent. Within recent years, however, a process of water treatment has been introduced with successful results. This process is unique in so far as railways are concerned, although a plant operating on similar principles was used for treating the water for stationary boilers at the Leonora goldfields in Western Australia.

The principal water troubles encountered on the Trans-Australian line were scaling, corrosion, foaming, and priming, and in operating the train service almost continuous leakage of boiler tubes resulted, with consequent long delays to trains and generally most uneconomical working. The scaling, resulting from calcium and magnesium salts, formed an incrustation in the boiler, sometimes $\frac{1}{8}$ in. thick, causing loss of locomotive efficiency, with overheating and burning of firebox plates. The magnesium chloride content of the locomotive boiler water amounted in some cases to 38 grains to the gallon, and, under the pressures and temperatures obtaining, liberated hydrochloric acid and caused virulent corrosion of the boiler plates in the form of pitting, grooving and wasting. Another contributory factor causing corrosion was the electrolytic action set up between the copper and steel, and between portions of steel plates having dissimilar characteristics.

Priming is, of course, a source of continual worry to engine drivers, and seriously handicaps the maintenance of scheduled running times, but fortunately it was possible to reduce this to a minimum by the use of an anti-foam compound containing castor oil. The scaling and corrosion, however, were much more serious and difficult to treat, and after thorough investigation it was decided to try out the new form of treatment which had proved successful at the Sons of Gwalia Mine, near Leonora, Western

Australia. A trial plant was erected at one of the most troublesome watering stations along the 1,051 miles of railway, and the results were so successful that the Commonwealth Railways Commissioner, Mr. G. A. Gahan, M.I.E.A., had plants erected at two other stations.

The treatment consists of the agitation of cold well and bore water with weighed amounts of caustic lime and barium carbonate, in vats of 15,000 gall. capacity. The agitation usually occupies about six hours. Before agitation is stopped, tests are conducted on each vat, and additional lime added as necessary. The vats are then allowed to stand overnight for the settlement of the precipitates. The result of the treatment is that calcium, magnesium bicarbonates, and calcium sulphate are precipitated, and no other salts are left in solution replacing them. Magnesium chloride is converted into magnesium hydrate and soluble calcium chloride. Thus both carbonates and sulphates are precipitated, but chlorides are left in solution either as sodium or calcium chloride, both of which have a very high solubility and are inert in boilers using treated water. The average cost of treatment per 1,000 gall. amounts to approximately 1s. This cost is fully justified in view of the immense saving in boiler maintenance, avoidance of delays to trains through engine failures, saving in coal consumption through more efficient working of locomotives, and so on.

Water supplies from the treatment plants are transported by water trains in 8,000-gall. tank wagons for distances up to 500 miles. Before the installation of the latest plant, water was conveyed from Kalgoorlie to Cook, a distance of 538 miles, but this did not represent the full distance of conveyance, for prior to being loaded on the train this water had been piped a distance of 350 miles from Mundaring to Kalgoorlie. At Cook a locomotive would commence an eastbound journey with a water wagon and locomotive boiler full of Mundaring water, so that at the concluding stage of this trip the locomotive would be operating on water which had come from a reservoir, 1,100 miles away.

Since the treatment plants have been operating, the delays to trains resulting from boiler troubles have been reduced to a minimum; the cost of boiler maintenance has been decreased, and the life of boilers, particularly with copper fireboxes, is showing a corresponding increase.

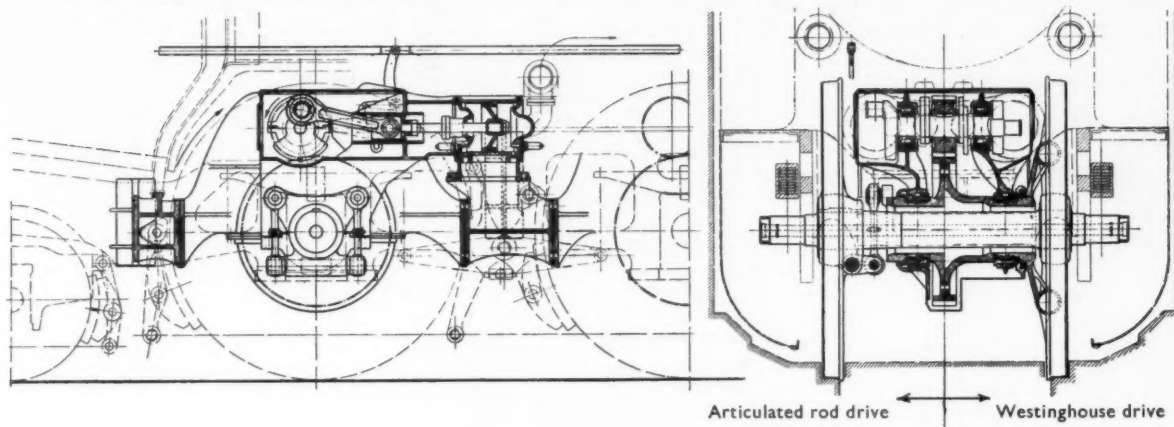
INDIVIDUAL AXLE DRIVE FOR HIGH-SPEED STEAM LOCOMOTIVES

A Henschel design incorporating the use of small horizontal steam engines with geared transmission to the axles

IN an article entitled "Points in the Design and Development of Super-Speed Steam Locomotives," Dr.-Ing. Kurt Ewald,* of Kassel, discusses the question of improving acceleration in handling ultra high-speed passenger trains. Remarking that with the use of boosters, acceleration rates, although improved, fall behind those obtainable with electric and diesel traction, he points out that the inherent deficiency lies in the grossly varying tangential pressures and the resultant uneven torque of the steam reciprocating locomotive with direct drive. Indirect

driving axle springs are above the axleboxes, outside the frame, and the high-pitched wide spring base favours the negotiation of sharp curves. The maximum speed of the steam motor is about 1,100 r.p.m. with a gear ratio of 1:2.5, driving wheel diameter 2,000 mm. (6 ft. 6 $\frac{3}{4}$ in.), piston stroke 240 mm. (9.5 in.), and maximum mean piston speed 9 m. (29 ft. 6 $\frac{3}{4}$ in.) per sec. The maximum travelling speed thus provided is 180 km. (112.5 m.) p.h.

Dr. Ewald visualises the development of this steam motor drive, as by compounding or increasing the number



Longitudinal and cross-sections of drive

drive by steam motors, similar to diesel or electric transmission, he states, seems to hold out very promising possibilities for obviously the faster the steam motor is made to run, the more cylinders that are provided, and the higher the gear ratio between the motor and the driven wheel, the better will be the acceleration obtained. From the designing point of view the least difficulty is likely to be experienced with an arrangement for operating each driving axle individually.

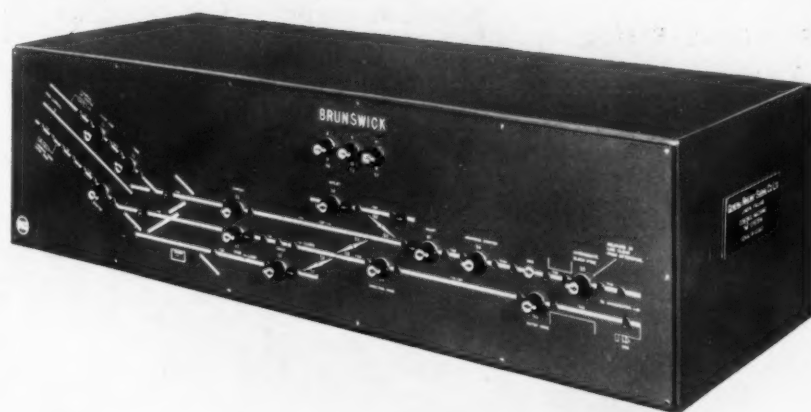
With this in mind the technical staff of the Henschel firm has designed an arrangement as illustrated in the accompanying drawing. In this layout the steam motor consists of two horizontal steam engines with cranks placed at 90 deg. to one another, driving on a common crankshaft and transmitting power to the driving axle through toothed gearing and a hollow shaft. The relative movements between this shaft and the driving axle caused by the action of the springs are taken up by constructional elements of the same description as those used in electric locomotives. The crankshaft and hollow shaft are carried in a common steel casting bolted to the engine frame, the whole drive therefore being arranged in the sprung portion of the locomotive and unaffected by the play of the springs and jolts from the rail joints. The steam motor and transmission gear are enclosed in a dust- and oil-proof housing, and the frame is outside the wheels, thus enabling the complete driving unit to be dismantled downward without undue effort and replaced by a spare unit if required. The driving axleboxes are located outside the wheels, thus affording ready access to them. The

of cylinders to three, four, or even more, and points out that in addition to the advantage of high acceleration, individual axle drive by steam motors offers another valuable feature, namely, very smooth running. The disturbing movements are extremely small and practically of no consequence; the free centrifugal forces are also of a low order, and being distributed over all the axles are therefore negligible. Moreover, almost perfect balancing can be obtained by a pair of counterweights moving in opposite directions and coupled by tooth gearing.

Bar Frames in India

In a discussion which followed the reading at a meeting of the Institution of Locomotive Engineers in Bombay, of a paper on "The Most Suitable Passenger Locomotive for Intensive Use and for Long Engine Runs" by Mr. H. P. Renwick, a speaker mentioned the results obtained with bar frames on Indian railways. In the old-fashioned bar frames accidents were usually much more serious, because years ago there were practically no drop pits in India; a frame of this sort usually broke over one or other of the driving or coupled axleboxes, owing to the shed staff lifting the engine with jacks at one end without due attention to packing. The repair to a break such as this naturally ruined the locomotive's record for mileage. These earlier bar frames were not, as a rule, very carefully designed as regards stresses and strains they might have to bear at various points. The modern rolled or cast steel bar frame, on the other hand, is a very different proposition, and with the increase in the size and number of cylinders today this kind of frame certainly has advantages over the plate frame, as it allows large cylinders to be worked into the design with greater ease.

* The author is one of the principal members of the technical staff of Henschel & Sohn A.G., Kassel. The article appeared in the "Henschel Review."



Left: Fig. 2—VX operating panel at Brunswick, Cheshire Lines Railway

Below: Fig. 3—Electric point-machine at entrance to down goods arrival line

extinguished if the signal lamp fails or the aspect is not in accordance with the position of the key. The position of each power-worked crossover is shown by a movable indicator, which responds to the movement of the points. Small red lights in the track circuit sections indicate when these are occupied, and white lights are provided to indicate when points are locked and cannot be moved.

Electric Locking and Special Working

The usual electric detection, approach locking, and route locking are provided; mechanically worked points are track-locked. To allow freedom for shunting movements, push keys marked "R," seen beyond the crossovers at the left of the panel in Fig. 2, are provided to



Fig. 4—Position light shunt signal



Fig. 5—Four-aspect running signal



Fig. 6—Three-aspect running signal

release the local locking when necessary. Interlocking between the panel controlled functions and the mechanical levers is effected by means of electric lever locks and circuit controllers. The entrance to the locomotive yard by the Dingle tunnel is out of sight, and special means of controlling engine movements have been devised. Normally, enginemmen have the use of the spur for marshalling purposes, and Key 56, seen under the word "outlet" in the centre of the panel in Fig. 2, is kept turned for it, signal 56 showing yellow. When the signalman has an engine for the shed he first restores the Key to normal, which places the signal at "stop," and a loud sounding bell rings for 30 seconds, warning enginemmen in the shed to make way. After this interval points 60 are free to be reversed by the setting of Key 61 and the depressing of the engine shed button.

When an engine is ready to leave the shed, the driver

informs the signalman by telephone, who, if he can permit the movement, restores Key 56 to normal and turns it again, then presses the up main completion button, which sets points 60 and clears signal 56 for the engine to come out. An illuminated indicator "M" is exhibited over the signal aspect in these circumstances. Shunt signals 61 and 57 are of the position light type, the former having illuminated route indication signs "G," "M" and "S," for the goods, main and siding routes respectively.

As a further step towards simplification of traffic control, the working of this installation of NX interlocking will be watched with much interest. The scheme for it was prepared to meet the requirements of Mr. G. Leedam, Manager and Secretary of the Cheshire Lines, by Mr. K. C. Marrian, Resident Engineer, to whom we are indebted for permission to describe it, and the work has been carried out by the General Railway Signal Co. Ltd.

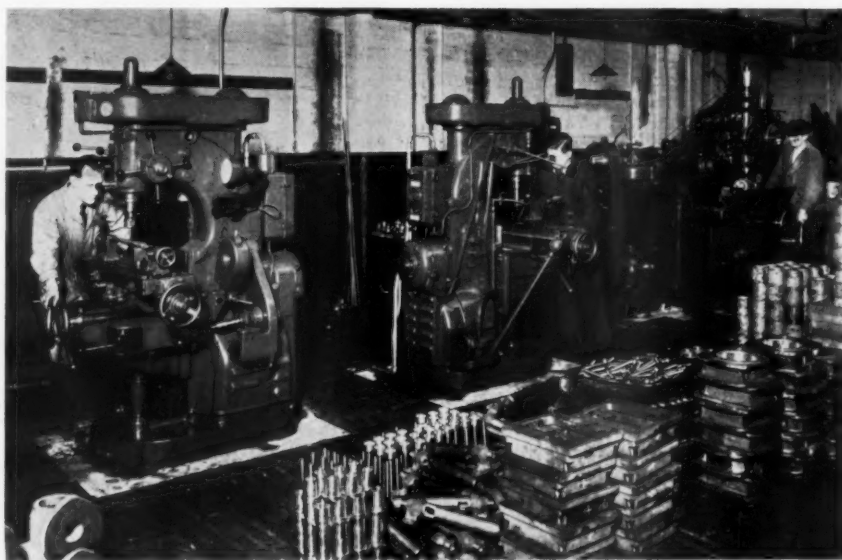
MACHINING LOCOMOTIVE TOOLS IN CREWE WORKS

THE accompanying illustration* shows three new machines installed in the Crewe works of the L.M.S.R., and in the foreground will be seen an assembly of locomotive parts of the kinds dealt with on these machines. These include various components such as ejector and injector spindles, steam plugs, pistons for drivers' brake valves, whistles, brake cylinder piston rings, and other items, which are dealt with on the two Archdale 18-in. high-speed vertical milling machines seen on the left. High-speed steel cutters are used. These machines, made by George Richards & Co. Ltd., Broadheath, Manchester, were designed to meet the need for a small high-speed vertical milling machine at a height of 6 ft. 2 in., and capable of operating economically on various metals, two separate speed ranges being provided for the purpose.

The frame consists of a well-ribbed body casting of ample strength, mounted upon a deep section base forming a sump for the coolant. The machine is motor driven, and the spindle runs in Timken type roller bearings. The change-speed levers are interlocked with the stop and start lever to prevent changes of speed being made whilst the spindle is running. Among other things noted during our inspection of these machines was the silent operation, which, we were informed, is largely accounted for by the fact that the change-speed gearing is ground to the tooth profile after hardening.

The machine furthest from the camera in the reproduction is a Richards No. 2V.K. type slot drilling and keyway cutting machine. When our photograph was taken, this was operating on a small coupling rod bush; other work dealt with consists of large coupling rod bushes, con-

necting rod big end brasses, and other tools. The machine has only recently been installed at Crewe, and we are therefore unable to give any information regarding production times. We can, however, say that this model represents the latest development in vertical keyseating machines, and embodies the one-cut system. The cutter sinks to depth and is automatically changed into horizontal feed, cutting the groove or keyway to any desired



Three new machines made by George Richards & Co. Ltd., and installed in Crewe works

length and depth at one cut. Six rates of automatic feed are provided in both the vertical and horizontal directions, and are arbitrarily arranged with the down feed considerably finer than the longitudinal one. Hand feed both horizontally and vertically is also provided to the spindle by conveniently placed handwheels. The table is adjustable for height by handwheels, and also has a small cross adjustment for use on the irregular work, or work in special jigs. The machine is fitted with a gearbox providing nine changes of speed through two sets of triple sliding gears, and is arranged for direct motor drive.

* By the courtesy of Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R.

SIGNAL SCHOOL AT THE RAILWAY TRAINING CENTRE, ROYAL ENGINEERS, LONGMOOR

By Major F. J. BIDDULPH, M.C., R.E.



Slough junction showing lever frame and signals, also block instruments and signalling diagram on wall in background

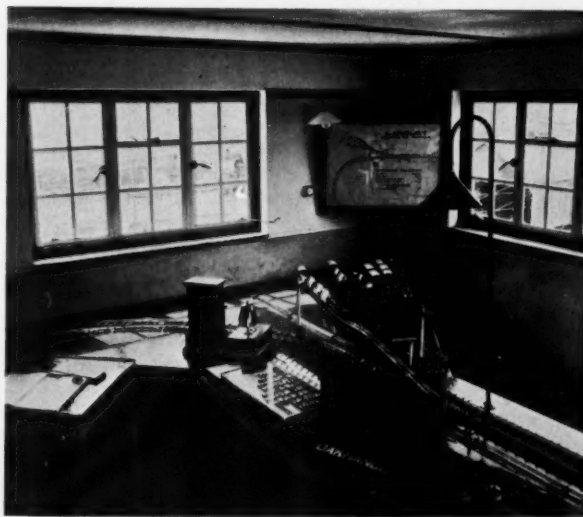
THE primary *raison d'être* of the signal school at Longmoor is to train railway tradesmen of the Royal Engineers in rules and regulations for the safe working of a railway. This applies chiefly to blockmen (the military equivalent of signalmen), brakesmen and shunters, engine drivers, and firemen. It is also used to teach officers and traffic operators (the equivalent of stationmasters, yardmasters, and train controllers) the application of railway operating principles; and signal fitters the elements of mechanical interlocking. With the above objects in mind its layout and equipment will be better appreciated.

The school consists of a model railway of No. 0 gauge as shown in plan in one of our illustrations. It is electrically operated from a diagrammatic switchboard, with coloured lines to correspond with similarly coloured lines on the vertical side panels of the model. On each coloured section of the switchboard is mounted a two-way and neutral-position switch by means of which an engine on that section can be moved in either direction or brought to a stand. The layout may be seen in the diagram reproduced on page 660, and sections of it in the other illustrations herewith.

Stations are constructed to different types of layout, designed to become progressively more complicated round the school. Beginning with Oakhanger the novice blockman is introduced to the simplest type of single line crossing station, equipped with S.L. (station limit) boards, flag boards, and with hand-worked points. This unusual type of signalling has been found to be an excellent adjunct in training novices in that it necessitates thinking and working from first principles, mechanical protection and complications being absent. Its importance in military railway working lies in its possible utilisation on active service. In the event of a captured railway being taken over it could be quickly and easily installed. It is interest-

ing to note that a development of this type of signalling, in which semaphore signals and rodding are replaced by station limit boards, was recently authorised for the Boroughbridge branch of the L.N.E.R.; it was described and illustrated in THE RAILWAY GAZETTE of February 14, 1936.

On the Oakhanger-Whitehill section, block working is by electric token, and Whitehill is an example of a one-man crossing station with key-locked points. In order to



Langley box and yard with telephone to Oakhanger in foreground and lever frame beyond it

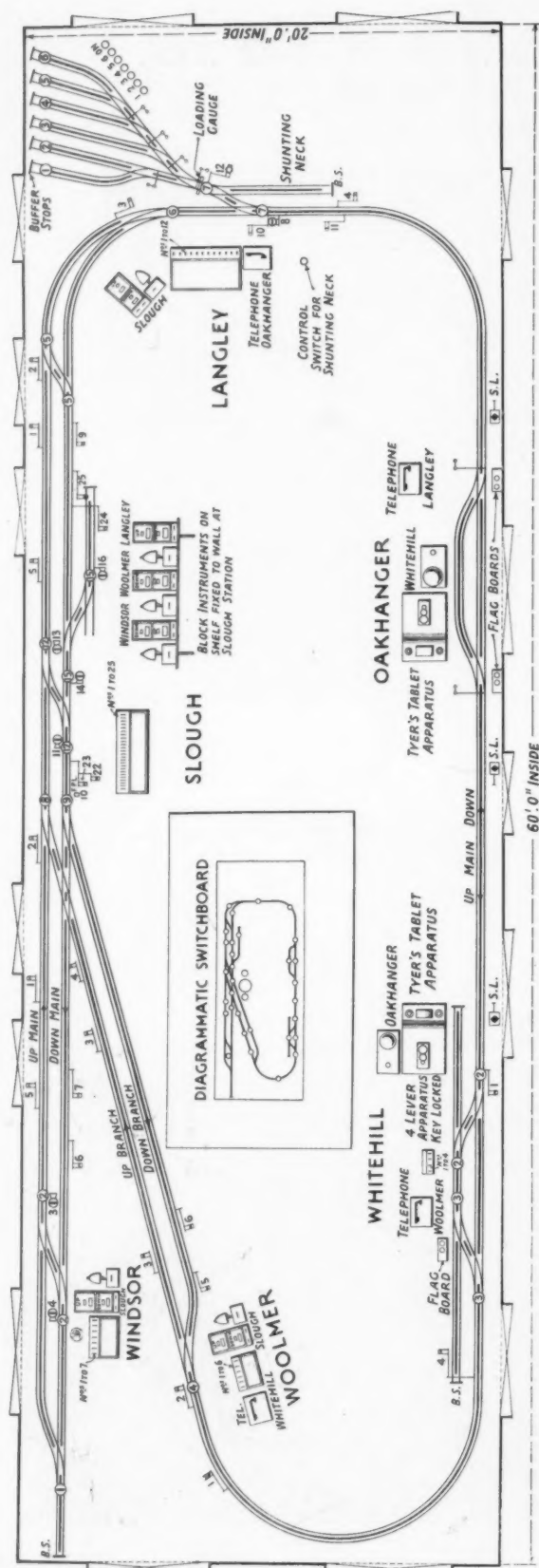


Diagram of the complete layout showing double and single main lines, loops, sidings, signals, block instruments and diagrammatic switchboard



Slough on the extreme left, Langley in left background and Oakhanger with passing loop on right



Whitehill, Woolmer and Windsor stations with Slough junction on the extreme right

GENERAL DIAGRAM AND VIEWS OF THE LONGMOOR SIGNAL MODEL RAILWAY

reverse a crossover it is necessary to insert a key in the lever lock, which key is itself locked in by reversing the points. The other crossover points which also require the same key cannot therefore be reversed at the same time.

Between Whitehill and Woolmer block working is by the telephone and line clear ticket method. Woolmer is equipped with a lever frame, the interlocking gear being placed horizontally in a glass case. It has an up distant signal in addition to homes and starters. The next two sections and the Windsor branch are worked with Sykes double-line three-position block instruments.

Slough is a double-line junction station complete with outer home, home, and starter signals and with one siding. The interlocking gear of the 25-lever frame is exposed to view for purposes of demonstration in the same manner as those at Woolmer and Langley. Langley is equipped with a marshalling yard and shunting neck. Movements in the marshalling yard are controlled by a two-way switch mounted conveniently at the station instead of on the main switchboard. Cutout switches are provided for each siding.

Power is provided by two 6-V. accumulators and is supplied through a third rail in the centre of the track; the accumulator being charged from the mains. All the stock is fitted with automatic couplings consisting of rounded buffer-beams with pieces of spring steel fixed to them. The locomotives are geared down to run as slowly as possible in an attempt to give adequate time in sections. It has been found that approximately 25 ft. p.m. is the minimum speed which is feasible from mechanical considerations.

In addition to training novices of the trades mentioned above in rules and regulations, the model has proved to be extremely useful for instruction in marshalling and shunting, and also for the more advanced work of operating. Trains are run to a graphic timetable in order to teach controllers their duties; and accidents, which block the line, are staged in order to encourage initiative and resource in dealing with situations that are liable to arise (see editorial note on page 642).

(Crown copyright reserved. Reproduced with the permission of the Controller of H.M. Stationery Office.)

"LORD NELSON" CLASS ENGINE NO. 857, SOUTHERN RAILWAY

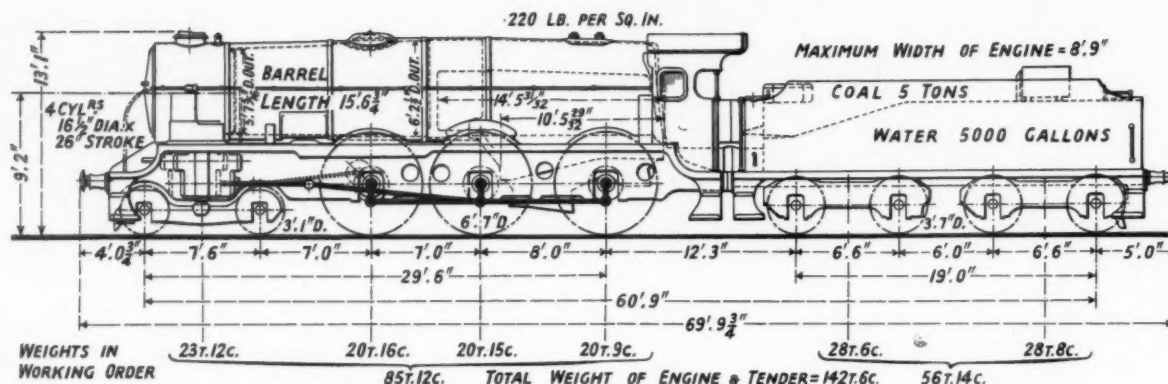
*Fitted with enlarged taper boiler having a
round-topped firebox with combustion chamber*

ONE of the four-cylinder 4-6-0 type express engines of the Southern Railway's "Lord Nelson" class, No. 857, *Lord Howe*, has recently been fitted with an enlarged boiler having a round topped firebox. This has been accomplished without appreciably increasing the total weight of the engine by constructing the shell of the boiler of 2 per cent. nickel steel plates. It may be remembered that the "Lord Nelson" class (fully described in THE RAILWAY GAZETTE of October 15, 1926) has Vibrac

alloy steel motion parts, and the use of higher tensile steel for the boiler is another stage in the improvement of the power-weight ratio. The heating surfaces and volume of the copper firebox have been considerably augmented by the addition of a combustion chamber extending into the barrel. This has had the effect of shortening the distance between tube plates, and has led to the introduction of 1½-in. dia. tubes. The superheater surface has been increased, and the elements are of the Sinuflo type;



This is the fourth locomotive of the "Lord Nelson" class to incorporate slight variations from the original design. One has a longer boiler barrel, one a Kylchap double chimney, and a third has the inside cranks at right angles to those outside



Dimensioned line drawing of Southern Railway 4-6-0 No. 857, "Lord Howe," as now fitted with enlarged taper boiler and round-top firebox

actually the total heating surface is slightly decreased in the new boiler, as is shown in the table reproduced below.

The weight of the engine in working order is 85 tons 12 cwt., as against 84 tons 16 cwt. with the original boiler,

the respective empty weights being 77 tons 5 cwt. and 77 tons 2 cwt. We are indebted to Mr. R. E. L. Maunsell, Chief Mechanical Engineer, Southern Railway, for the above information, together with the originals from which the illustrations have been reproduced.

Boiler	Firebox type	Working pressure	Tubes	Length between tube plates	Heating surface				
					Small tubes	5 1/4 in. flue tubes	Firebox	Total	Super-heater
Original	Belpaire ..	lb. 220	2 in. dia.	14 ft. 2 in.	sq. ft. 1,359	sq. ft. 544	sq. ft. 194	sq. ft. 2,097	sq. ft. 399
New ..	Round top	220	1 3/4 in. and 2 in. dia.	13 ft. 0 in.	979	628	246	1,853	460

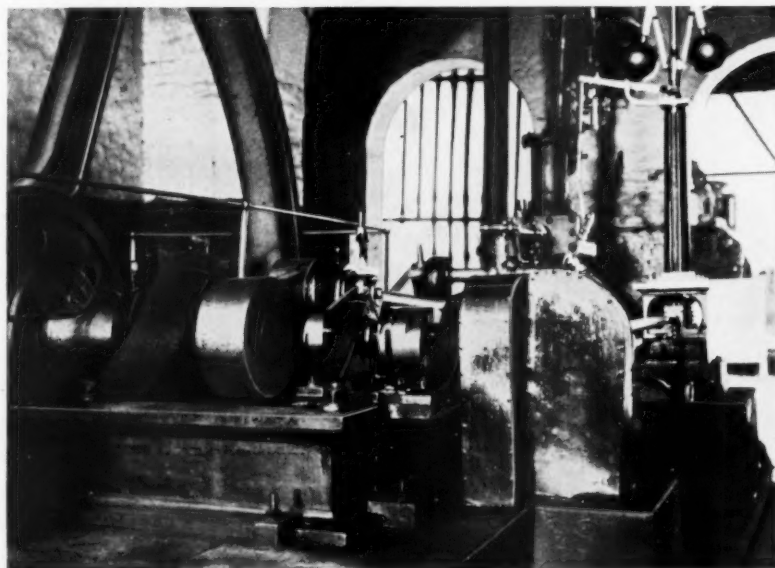
A Veteran in India

The Chief Commercial Manager of the East Indian Railway has sent us the interesting photographs we reproduce of this 80-year-old engine, together with the following notes:—

"This engine was built at the Railway Foundry, Leeds, in 1856, and was installed at Allahabad to give power for the locomotive repair shops there in 1860. When the locomotive repair shops were closed down, the engine was retained, and has since worked continuously at its present duty most successfully, and it may be said, that since erection, the engine has only been under repairs of any magnitude on one occasion owing to fracture of the crank shaft, and is still fit for many more years work. Particulars of interest in the engine are—

Diameter of fly wheel .. 14 ft. 6 in.
 " " cylinder .. 20 1/8 in.
 Operated by slide valve, governor controlled.
 Main driving pulley .. 6 ft. 4 in.

"Unfortunately, 'Old Faithful' now has to give way to the march of time" [and to electric power Ed. R. G.].



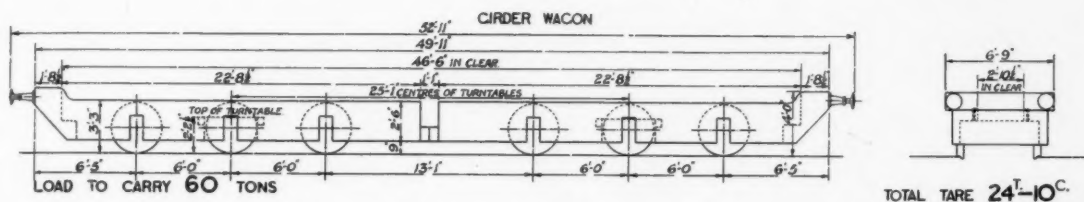
Above: Remarkable old horizontal engine at Allahabad running shed, East Indian Railway



Right: The maker's nameplate

G.W.R. Vehicles for Exceptional Loads—IV

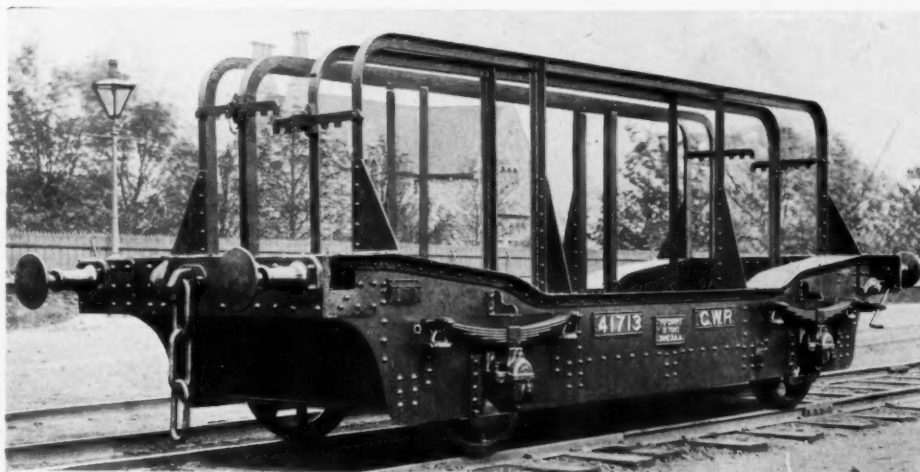
Two types of wagon for the carriage of large bridge girders, and a glass wagon which is readily adaptable for other loads of plate form



Dimensions of a 60-ton girder wagon for bridgework of exceptional size and weight. The halves of the wagon can be separated for supporting the ends of lengthy loads



Bogie well wagons for loads up to 35 tons, conveying 28-ton bridgework girders measuring 81 ft. in length



A 12-ton wagon specially designed for carrying glass in crates, but also suitable for ships' plates, sheet copper, and similar loads

The Fianarantsoa-Mankara Railway, Madagascar

(See description on page 651)



Ferro-concrete bowstring girder bridge over the Sakavia river at km. 112, amid typical scenery on this interesting line



Fianarantsoa terminus at the railhead of the line on the plateau, 3,586 ft. above sea level, with its neat buildings and well-laid-out surroundings set among wooded hills



Above: Ferro-concrete arch and girder viaduct over the River l'lonilahy near km. 72



Right: Typical hillside construction work on the 1 in 28 —1 in 33 grades near km. 116

Below: A standard type of ferro-concrete girder bridge used here over the Tatamali River near km. 121





A view of the Model Railway Club Exhibition at the Central Hall, Westminster. An account of the exhibits appears on page 676 this week



Left : Winners in the L.M.S.R. Quota competition, photographed with their trophies after the presentation at Euston on March 17 (see our issue of March 19). In the back row, left to right, are Sir Josiah Stamp, Mr. Ashton Davies, and Mr. E. J. H. Lemon. Right : H.R.H. The Duke of Kent presenting a London Chamber of Commerce gold medal to Miss Clarice Blackwell of the L.M.S.R. Central Office (see page 668)

RAILWAY NEWS SECTION

PERSONAL

Sir John E. Thornycroft, K.B.E., a Director of the Southern Railway Company, has been elected to succeed Sir Nigel Gresley as President of the Institution of Mechanical Engineers. Messrs. E. B. Ball, A. Binns, and W. A. Stanier (Chief Mechanical Engineer, L.M.S.R.) have been elected Vice-Presidents.

On his return from his Lancashire visit in connection with the Grand National, on March 20, the King presented Mr. T. Smith—who, as recorded in our issue of March 12, is retiring from the position of Station-master, Euston, L.M.S.R.—with a gold tie-pin surmounted by the Royal crest.

Mr. Kenneth Cantlie, Technical Advisor to the Chinese Ministry of Railways, has just arrived in the United Kingdom on leave for a period of about six months. He is a member of the board of trustees of the British Boxer Indemnity Fund, and his address in London is c/o the Chinese Government Purchasing Commission, 21, Tothill Street, S.W.1.

From *The London Gazette* of March 19:—

Regular Army, Supplementary Reserve of Officers; Royal Engineers, Transportation: Lt. G. A. Lemon to be Captain (March 20).

Territorial Army; Royal Engineers; Engineer and Railway Staff Corps: Major G. N. Shawcross, M.B.E., M.I.Mech.E., resigns his commission and retains his rank with permission to wear the prescribed uniform (March 20). Major Shawcross was formerly Chairman, North Western Branch, Institution of Mechanical Engineers.

Also, Col. Sir George William Humphreys, K.B.E., M.Inst.C.E., has received the Territorial Decoration.

Owing to the pressure of other duties, Mr. Oliver Bury has retired from the chairmanship of the Leopoldina Railway Company and of the Leopoldina Terminal Company; Mr. C. H. Pearson has succeeded him as Chairman of both companies. Mr. Oliver Bury remains on the two boards.

Mr. H. D. Searles-Wood, Chairman of the Sutton & Wimbledon Railway, left estate valued at £70,056 (£35,994 net).

Sir Maurice W. Brayshay, M.Sc., A.M.Inst.C.E., Agent of the Bombay, Baroda & Central India Railway, has been elected President of the Indian Railway Conference Association for the year 1937-38, and assumed office yesterday, April 1. He was educated at Ripon Grammar School and Leeds



Sir Maurice W. Brayshay, M.Sc.,

Agent, Bombay, Baroda and Central India Railway, elected President, Indian Railway Conference Association, 1937-38

University, was appointed by the Secretary of State for India as an Assistant Engineer in the State Railways in 1905, and was posted to the Eastern Bengal State Railway. From 1909 to 1915 he was employed on the construction of the Hardinge (Lower Ganges) bridge, as Assistant and Executive Engineer, and was afterwards transferred to the North Western Railway as Assistant Agent, a post he held until 1917. During 1917-18 Sir Maurice was Deputy Controller and then Controller of Timber Supplies, Indian Munitions Board, but in the latter year was appointed Assistant Secretary to the Railway Board. In 1924 he was selected as Deputy Agent of the B.B. & C.I.R., a position he held until 1929, though he acted as

Agent in 1927-28. In 1929 he became Engineering Member of the Railway Board, but upon the retirement of Sir Ernest Jackson in 1932, Sir Maurice succeeded him as Agent of the B.B. & C.I.R., the position he still holds. He was, however, appointed to act temporarily as Chief Commissioner of Railways, in 1933, and again in 1935, during the absence of the Chief Commissioner on leave. It was in the King's birthday honours list in 1934 that he received his knighthood. As well as being a Master of Science, and an Associate Member of the Institution of Civil Engineers, he is a Member of Council of the Institution of Engineers, India.

G.W.R. APPOINTMENTS

The G.W.R. announces the following appointments:—

Mr. H. A. Henry, Assistant Divisional Engineer, Neath, to be Resident Engineer, Chief Engineer's Office, Paddington.

Mr. V. R. Illingworth, Assistant in the Chief Engineer's Office, Paddington, to be Assistant Divisional Engineer, Neath.

Mr. R. F. Thurtle, Clerk, General Manager's Office, Paddington, to be Editor of the *Great Western Railway Magazine*.

Mr. R. H. Rice, Coal Shipping Section, Newport Docks, to be Assistant Dock Manager, Newport Docks.

L.N.E.R. APPOINTMENTS

The L.N.E.R. announces that the following appointments have been made:—

Mr. W. E. Blakey, Assistant Goods Manager, North Eastern Area, to be District Goods Manager, Leeds, in succession to Mr. A. Brown, who retired from the service at the end of March.

Mr. B. X. Jessop, Assistant to the District Passenger Manager, Newcastle, to be Assistant District Goods Manager, Leeds.

Mr. W. Howard-Williams, C.B.E., Chairman, Central Argentine Railway, arrived in Buenos Aires on March 9 on a business visit.

Mr. J. M. Eddy, C.B.E., Director of the B.A. Great Southern and B.A. Western Railways, who has been on a business visit to Buenos Aires for the past few weeks, returned to England on March 12.

LONDON CHAMBER OF COMMERCE
AWARD TO L.M.S.R. CENTRAL OFFICE
EMPLOYEE

The distribution at the Mansion House by His Royal Highness The Duke of Kent, K.G., K.T., G.C.M.G., G.C.V.O., of the medals and prizes awarded by the Commercial Education Committee of the London Chamber of Commerce, and presided over by the Rt. Hon. the Lord Mayor, took place on Tuesday, March 23. The "Prince of Wales" gold medal and first class certificate with distinction were awarded to Miss Clarice E. Blackwell for proficiency in the subject of "The History, Geography and Economic Resources of the Empire" at the chamber's examinations open to any British subject in the Dominions and Great Britain held last spring. Miss Blackwell, who is a Fellow of the Royal Society of Arts and an Associate of the Chartered Institute of Secretaries, is a member of the staff of Mr. O. Glynne Roberts, Secretary of the L.M.S.R., Euston, and is employed in the Central Office.

We regret to record the death on March 28 of Mr. Robert Christopher Irwin, C.B.E., the first Secretary of the L.M.S.R. Company, from which position he retired on November 16, 1927. Mr. Irwin entered the Secretary's Office of the L. & Y.R. in 1881, at the age

between the companies concerned in grouping in accordance with the Railways Act, 1921. He received the C.B.E. in 1925. Mr. Irwin was subsequently Chairman of Edward Wood & Company, the Manchester steel constructional engineers, and a Director



Miss Clarice Blackwell,

Awarded London Chamber of Commerce Gold Medal and First Class Certificate in History, Geography, and Economic Resources of the Empire

from the position of Editor, which he has held since 1919. Mr. Hadley joined the Great Western Railway in 1890 as a clerk in the Traffic Department at Bullo Pill, Gloucestershire. After experience at various places in Gloucestershire and South Wales, he was in 1906 appointed Chief Clerk to the Assistant Superintendent at Newport, in which post he was responsible in 1907-8 for the conception and introduction in the Eastern and Western valleys of Monmouthshire of the G.W.R. freight traffic control system. Subsequently, the Superintendent of the Line sent Mr. Hadley to introduce this system in the London, Birmingham, Bristol, and other divisions, where it is still in force. Mr. Hadley was transferred to the Staff Section of the General Manager's Office, Paddington, in 1912, being attached to the staff of the *Great Western Railway Magazine* as assistant to the Editor, Mr. (now Sir) Felix Pole, who edited the magazine from 1903 to 1919. Mr. Hadley succeeded him as Editor in the latter year. His association with the magazine has been marked by the initiation of several schemes which have proved of permanent value. A series of articles which he began in 1913 was instrumental in introducing the "Safety First" movement to this country, and the "Is it



[Elliott]

[G. Fry]

The late Mr. R. C. Irwin,

Secretary to the London Midland & Scottish Railway Company, 1923-27

of 16. In 1886 he left the office to take up the position of Goods and Fish Canvasser in the North Eastern Area of that system, with headquarters at York; but, returning in 1889 as Chief Clerk, was appointed Secretary in 1899. When the L. & Y.R. was amalgamated with the L.N.W.R. on January 1, 1922, Mr. Irwin became Secretary of the combined companies, and was appointed Secretary of the L.M.S.R. on its formation in the following year. Mr. Irwin was actively concerned with the settlement of terms



Mr. E. S. Hadley,

Editor, "Great Western Railway Magazine," 1919-1937

of Settle, Speakman & Company, as well as other companies. Cremation took place on Wednesday last at Manchester.

Those present included Mr. S. T. Jones (representing Sir Josiah Stamp and Mr. O. Glynne Roberts), Mr. Ashton Davies, Mr. F. H. Cowell, Mr. H. G. Humphreys, Mr. G. Nutter, Mr. W. O. Hickson, Mr. L. C. Brittlebank, Mr. J. H. Robinson, Mr. F. Hauxwell, and Mr. J. Wood.

With the publication of the April issue of the *Great Western Railway Magazine*, Mr. E. S. Hadley retires



Mr. T. E. Brain,

Appointed Assistant Secretary, Southern Railway Company

Safe?" pocket token associated therewith is one of his numerous contributions to its development. Later, he advocated the formation of a society which in 1922 he founded as the G.W.R. Social and Educational Union (now the G.W.R. Staff Association), and he has at all times interested himself in the promotion of staff welfare activities. The passenger and freight train, and freedom from accident competitions—long-standing features of the *G.W.R. Magazine*—were all initiated by Mr. Hadley, who will enjoy in his

retirement the good wishes of all who knew him personally or through his widespread activities. Mr. Hadley is succeeded as Editor by Mr. R. F. Thurtle, as announced on page 667.

Mr. T. E. Brain has been appointed Assistant Secretary of the Southern Railway Company as from April 1, on the retirement of Mr. W. J. Hatcher.

Mr. Brain was educated at Burford Grammar School, and Dean Close School, Cheltenham, and joined the London Chatham & Dover Railway in 1897, on the introduction of Mr. J. S. Forbes, the then Chairman, a position being given him in the Secretary's Office at Victoria under the late Mr. John Morgan. After the amalgamation of London, Chatham & Dover and South Eastern interests in 1899, Mr. Brain was transferred to the Joint Secretaries' Office at London Bridge. In October, 1920, he was placed in charge of the section dealing with all the committee work of the S.E. & C.R. Following the amalgamation to form the Southern group, he was transferred to Waterloo in March, 1924, and was appointed Committee Clerk in April, 1930. In May next he will have completed 40 years' railway service; during his career he has worked under six secretaries.

Mr. W. J. Hatcher has completed over 50 years' railway service, having joined the London & South Western Railway in 1886. He was appointed to the Secretary's Office in January, 1891, under the late Mr. Frederic Macaulay. In October, 1915, he was appointed Chief Assistant to the Secretary (Mr. Godfrey Knight), and held that position until the amalgamation in 1923, when he was appointed Assistant to the Secretary of the Southern Railway. He has served under eight chairmen and was presented recently with the gold medal for 50 years' service.

We regret to record the death in Buenos Aires on March 1, at the age of 82 years, of Mr. Edward Marsh Simpson, M.Inst.C.E., who was for many years prominently associated with important engineering schemes in Argentina, mainly in connection with port works. He was born in Yorkshire, in 1855, educated at King's College, London, and completed his engineering studies in Belgium. As a young man, he gained experience with the late Sir John Wolfe Barry on the completion of the Inner Circle of the London Underground system. In 1885 he went to Buenos Aires, where he was employed under the late Sir John Hawkshaw on the surveys and plans for the Madero Port, the construction of which he initiated some two years later. Thereafter he was successively engaged on the construction of the Buenos Aires South Dock, the erection of grain elevators at Ingeniero White, and the construction of the summit tunnel of the Transandine Railway.

The last and most important work on which he was occupied was the construction of the New Port of Buenos Aires, for which C. H. Walker & Company were the contractors. After his retirement in 1930 he went to live in England, but returned to Argentina in 1934.

Mr. W. J. Skillicorn, at present Assistant General Manager (Commercial) of the South African Railways and Harbours, will take up the appointment of General Manager of the Rhodesia Railways in April, 1938, when Mr. H. Chapman, C.B.E., Resident Director in Africa, who has also held the position of General Manager for many years, will relinquish the latter position.

MEMORIAL SERVICE FOR

Mr. J. S. ANDERSON

A memorial service for the late Mr. J. S. Anderson, Secretary and Treasurer of the London Passenger Transport Board, whose death was recorded in our issue of March 19, was held at Christ Church, Westminster, on March 22. In addition to members of the family the following officials of London Transport were present or represented:—

Lord Ashfield (Chairman), Mr. Frank Pick (Vice-Chairman), Sir Edward Holland (Member of the Board), Mr. John Cliff (Member of the Board), Mr. R. S. Oakenfull (representing Brig.-Gen. Sir Henry Maybury, Member of the Board), Mr. M. H. Gibbs-Smith (representing Mr. P. Ashley Cooper, Member of the Board), Mr. C. S. Louch (Comptroller and Accountant), Mr. T. E. Thomas (General Manager, Road Transport), Mr. J. P. Thomas (General Manager, Railways), Mr. H. S. Chapman (Assistant Secretary), Mr. A. R. Cooper (Chief Engineer), Mr. E. Rawdon Smith (Public Relations Officer), Major R. Falshaw Morkill (Assistant Signal Engineer), Mr. Evan Evans (General Superintendent, Railways), Mr. Ernest Evans (Divisional Superintendent, Railways), Mr. A. V. Larcombe (Indoor Superintendent).

Among others present at the service were:—

Sir Edmund Wyldbore Smith (Director, Pullman Car Co. Ltd.), Mr. C. E. R. Sherrington (Secretary, Railway Research Service), Mr. G. W. Duncan; Mr. W. F. Smith and Mr. H. Haigh (representing Railway Convalescent Homes), Mr. E. E. Painter (Secretary, Railway Clearing House), Mr. P. J. Dowsett (Assistant Secretary, L.N.E.R.), Mr. F. E. Paine (representing Mr. I. Buchanan Pritchard, Chief Legal Advisor and Solicitor, L.N.E.R.), and Mr. H. Davis (representing Mr. W. V. Wood, Vice-President, L.M.S.R.).

RETIREMENT OF MR. ALFRED BROWN

At the conclusion of the West Riding Local Officers' Conference held at Leeds on March 18, the members were entertained to luncheon at the Great Northern Hotel on the personal invitation of Sir John Eaglesome, Managing Director of the Aire & Calder Navigation. The occasion was chosen to mark the retirement—referred to on page 667—of Mr. Alfred Brown from the position of District Goods Manager, Leeds, L.N.E.R., after completing a service of nearly 51 years, and to present him with a tangible memento of the high regard in which he is held by all who have been associated with him. Mr. Metcalfe, Traffic Manager of the Navigation, in making the presentation, which took the form of a silver entree dish, referred to the esteem in which Mr. Brown was held and, whilst

regretting the loss of such a valued colleague, hoped that he would live for many years to enjoy the leisure he had earned. Mr. Brown suitably replied.

GREAT SOUTHERN RAILWAYS (IRELAND) APPOINTMENTS

Mr. M. J. Ginney, Running Assistant to the Chief Mechanical Engineer, has been appointed Running Superintendent.

Mr. McNab, District Locomotive Superintendent at Waterford, has been transferred to Inchicore as Assistant Running Superintendent, and Mr. C. Tyndall, Assistant to the District Locomotive Superintendent at Cork, becomes District Locomotive Superintendent at Waterford.

L.M.S.R. APPOINTMENTS

The following appointments have been approved by the directors:—
Chief Commercial and Chief Operating Managers' Departments

Mr. J. Burnley, Chief Clerk, Sheffield (Wicker), to be Goods Agent, Chesterfield.

Mr. H. Preston, Stationmaster, Luton (also i/c of Luton, L.N.E.R.), to be Stationmaster, Northampton (Castle) (also i/c of Bridge Street and St. John's stations).

Mr. V. L. Ward, Stationmaster, Chesterfield, to be Stationmaster, Luton (also i/c of Luton, L.N.E.R.).

Labour and Establishment Office

Miss H. Catto, Divisional Lady Welfare Supervisor (Northern Division), Glasgow, to be Welfare Assistant (Women and Girls), Euston.

Scottish Changes

Mr. R. Hunter, Goods Agent, Edinburgh, to be District Goods and Passenger Manager, Motherwell.

Mr. D. Shankland, Assistant District Controller, Motherwell, to be District Controller, Motherwell.

Mr. A. Anderson, Goods Agent, Leith, to be Goods Agent, Edinburgh.

Mr. J. M. Cameron, Chief Goods Clerk, Dundee West, to be Goods Agent, Leith.

Mr. J. Rankin, Stationmaster, Perth General, to be Stationmaster (also i/c of booking office), Glasgow (Central).

Mr. T. Coyle, Stationmaster and Goods Agent, Newton, to be Stationmaster and Goods Agent, Carstairs.

Mr. D. H. Pearson, Resident Storekeeper (Locomotive, Carriage & Wagon Stores), Glasgow (St. Rollox), to be Assistant Stores Controller, Glasgow (St. Rollox).

Mr. D. Wilson, Resident Storekeeper (General, Sheetting and Provender Stores), Glasgow (St. Rollox), to be Outdoor Assistant, Glasgow (St. Rollox).

We regret to note the death, on March 23, of Lt.-Col. A. M. Berkeley, C.I.E., V.D., a former Chief Engineer of the Assam-Bengal Railway. After being educated at Rossall and trained as an engineer at the R.I.E.C., Coopers Hill, he went out to the A.B.R. in 1893 and became Chief Engineer in 1906. He volunteered for service

during the war and was sent to France and Mesopotamia, where he became Deputy Director of Railways, was mentioned in despatches and awarded the C.I.E. He was demobilised in 1919, and retired from railway service in the following year.

From *The London Gazette* of March 23; Lt.-Col. E. Kitson Clark is commissioned as a Deputy Lieutenant of the West Riding of the County of York and of the City and County of the City of York. He was President of the Institution of Locomotive Engineers in 1931 and is Chairman of Kitson & Co. Ltd.

We regret to record the death on March 22 of Mr. Douglas Valentine Leven, Superintendent of Records, G.W.R. and Secretary of the L.M.S. & G.W.R. Joint Committee. Mr. Leven, who joined the service of the Great Western Railway about forty years ago, made a keen study of railway history, upon which he was an acknowledged authority. For many years past he has contributed historical and descriptive articles to the *G.W.R. Magazine*, and his duties as Superintendent of Records included the custody of the valuable collection of documents at Paddington. Mr. Leven was 59 years of age, and was due to retire shortly.

INSTITUTION OF LOCOMOTIVE ENGINEERS

The following have been elected members of the institution:—

Mr. G. A. Cox, Chief Draughtsman to the Chief Mechanical Engineer, Antofagasta (Chili) and Bolivia Railway.

Mr. J. Hutcheson, Deputy Chief Mechanical Engineer, South Indian Railway.

Transferred from associate member to member:—

Mr. J. G. P. Hamilton, Technical Assistant, Transportation Department, Rhodesia Railways.

Elected associate members:—

Messrs. Abd-el-Aziz Mahran, Egyptian State Railways; W. M. Moffatt, Calcutta Port Commissioners; A. Mostafa, Egyptian State Railways; R. H. Parker, Caprotti Valve Gears Limited; J. Soldati, F.C. Pacifico (Costa Rica).

Transferred from graduate to associate member:—

Mr. J. E. Croxall, L.N.E.R.

M. Charles Reinacher, a driver in the service of the Alsace-Lorraine Railways, has been awarded the Cross of Knight of the Legion of Honour in recognition of his heroic conduct in a railway collision. M. Reinacher was driving the Basle—Luxembourg express on September 22, 1935, when at a speed of over 60 m.p.h. it collided with an oil tank lorry at a level crossing near Remilly. The driver of the lorry was burnt to death by the blazing oil,

which quickly spread over the locomotive and the front coaches of the express. M. Reinacher, although suffering terribly from burns, stuck to his post and succeeded in pulling up the train in a few hundred yards. M. Reinacher, who probably will never completely recover from his injuries, doubtless saved the passengers in the wrecked train from the still greater danger of a catastrophic fire.

CANADIAN NATIONAL APPOINTMENTS

Mr. J. M. Walker, District Traffic Agent, Glasgow, has been appointed General Agent for Scotland, with offices at 107, Hope Street, Glasgow, C.2. Mr. J. M. Blair has been appointed to succeed Mr. Walker as District Traffic Agent, with office at the same address.

Capt. A. S. M. Nicholls, O.B.E., R.D., R.N.R., has been appointed Marine Superintendent, Canadian National (West Indies) Steamships Limited, in succession to Captain Robert A. Goudey, who has retired.

As a result of the recently concluded Anglo-Egyptian Treaty, the following Egyptian officials of the Egyptian State Railways have received recognition as under:—

Order of the Nile, Third Class: Mahmoud Bey Tewfik Ahmed, Chief Engineer, Way and Works; Zaky Bey Fahmy, Deputy Traffic Manager; Dr. Ibrahim Bey El-Shorbagi, Principal Medical Officer.

Bey, Second Class: Mohamed Kamal El-Khishin Bey, Secretary General; Ibrahim Bey Hilal, Goods Manager; Ayad Massoud Bey, Assistant Traffic Manager; Fuad El-Mawardy Bey, Assistant Superintendent of Stores; Hussein Seid Bey, Raml Electric Railways; Mustafa Amin Amer Bey, Engineering Department; Mohamed Tewfik Gomar Bey, Engineering Department.

Order of the Nile, Fourth Class: Dimitri Bissada Eff., Divisional Traffic Superintendent, Lower Egypt; Mohamed Fuad Aly Bey, Assistant Inspector General of Telegraphs and Telephones.

Order of the Nile, Fifth Class: Mohamed Fakhry Eff., Controller (Personnel and Labour Department, General Management); Mohamed Mustafa El-Khodary Eff., Assistant Secretary General; Kaisar Kandalaft Eff., Stores Department.

INDIAN RAILWAY STAFF CHANGES

Mr. E. C. Whelan has been appointed to officiate as Deputy Agent, N.W.R.

Mr. H. M. R. Morse, on return from leave, has been posted as Officiating Superintendent of Mechanical Workshops, N.W.R.

Mr. H. H. Cooper has been appointed to officiate as Deputy Chief Mechanical Engineer, N.W.R.

Mr. H. J. Mulleneux has been appointed to officiate as Chief Electrical Engineer, G.I.P.R., as from January 26.

We regret to record the death, on February 27, of Mr. Harold F. Lane, Washington Editor of our American contemporary the *Railway Age*.

The forthcoming retirement is announced of Mr. R. Hardie, Traffic Manager of the Romney, Hythe & Dymchurch Railway.

We regret to record the death of Mr. Wm. Varco Williams, J.P., a former member of the Port of London Authority, at Petersfield on March 21.

Mr. David Barrington, M.C., of the Karachi Port Trust, has been transferred from associate member to full member of the Institution of Civil Engineers.

Sir George Burton Hunter, formerly Chairman of Swan, Hunter & Wigham Richardson Limited, who died on January 21, left estate valued at £152,363 (£140,920 net.).

Mr. J. F. Clouter retired on January 20 from the post of Paying Cashier, London Transport, to which he was appointed on the formation of the London Passenger Transport Board in 1933. For many years previously he had held the same position with the Metropolitan District Railway, whose service he entered in 1890, at the age of 15.

GOLDEN WEDDING OF THE RT. HON.

H. G. BURGESS

As we noted briefly in our March 26 issue, the Rt. Hon. H. G. Burgess, formerly General Manager of the L.M.S.R., celebrated his golden wedding on March 17. Referring on that occasion to his distinguished career, *The Irish Times* wrote: "Always a man of immense energy and unusual abilities, he rose rapidly from comparatively modest beginnings in the railway world until finally he became General Manager of the London Midland & Scottish Company, possibly the most important position of its kind in the world. For many years Mr. Burgess was connected with the old London & North Western Company in Dublin. During the war he was appointed Government Director-General of Transport, Coal Controller, and afterwards Shipping Controller in Ireland, and it was largely for his brilliant work in these capacities that he received, in 1922, the signal honour of a Privy Councillorship. He also did a great deal of valuable work behind the scenes during the political negotiations in this country that followed the war, and his advice was sought by all parties, particularly in matters of economics, on which he is an expert. He was nominated by Mr. W. T. Cosgrave as one of the original members of the Free State Senate." Mr. Burgess's connection with what is

now the L.M.S.R. group was of long standing, for he entered the service of the L.N.W.R. in 1878, after starting his railway career with five years as a junior clerk on the Dublin & South Eastern. He continued with the L.N.W.R. until grouping, at which time he was acting as Deputy General Manager; he remained in this post under the re-organisation scheme, and was appointed General Manager of the L.M.S.R. group in February, 1924. His retirement took place at the end of March, 1927. Mr. Burgess was for 22 years Manager of the Dundalk, Newry & Greenore Railway, and for 20 years a Member of the Dublin Port and Docks Board. He was also a Director and Deputy-Chairman of the Dublin & South Eastern Railway, a Director of the Dundalk, Newry & Greenore Railway, and a member of the Unemployment Grants Committee in London. In 1925 he joined the board of the Great Southern Railways, having been nominated by the L.M.S.R. as its first representative in that position. He left the board in December, 1929. On March 12 of that year the Senate of Dublin University conferred upon him an honorary degree of LL.D.

Mr. John F. Heaton has been co-opted to the board of the Bath Electric Tramways Limited, and has been elected Chairman. It will be recalled that this is now a railway-associated company, control having been secured in October last by the Bristol Tramways & Carriage Co. Ltd., as recorded on page 661 of our Road Transport Section for October 23.

It is now confirmed that the Viscount Escoriaza, a Director of the Northern of Spain Railway Company, and of several other important railways in Spain and Portugal, met his death in a prison at Santander. Senor Escoriaza was the President of the Railway Companies' Association in Madrid, and was for many years one of the best known personalities in Spanish railway circles.

We regret to record the death, at Hyères on March 20, at the age of 86, of Sir John G. Barton, C.B., F.S.I. Sir John Barton was Engineer of the Castleberg & Victoria Bridge light railway, and Joint Engineer of the Clogher Valley Railway. Among his official appointments was that of Government Arbitrator under the Board of Trade for light railways in Ireland.

Mr. Frank B. Low, Secretary of the Devon General Omnibus & Touring Co. Ltd. has been appointed Secretary and Manager of the company, following the resignation of Mr. Reginald G. Porte, the General Manager. Mr. Low will continue to make his headquarters at the company's London office, and Mr. W. H. Geere, formerly Assistant Manager, has been appointed Local Manager at Torquay.

May Timetable Alterations

Most important of the changes of train service which will operate with the introduction of the May timetables on the L.M.S.R. is the division from Crewe of the express now due in Euston at 8.10 p.m., and at present calling at Stafford and Nuneaton. The Liverpool portion will leave Crewe at 5.5 p.m., call at Nuneaton only, and run the 97.1 miles from there to Euston in 92 min. (instead of 108 min.), at 63.3 m.p.h., arriving at 7.40 p.m., and thus by effecting an acceleration of 30 min., cutting the Liverpool-Euston time to 3½ hr. The Manchester portion will leave Crewe independently at 5.10 p.m., call at Stafford only, and reach Euston at 7.47 p.m., 23 min. earlier, having run the 133.6 miles from Stafford in 129 min., at 62.1 m.p.h. Another alteration of importance is the division, north of Crewe, of the Midday Scot, which hitherto, owing to its weight and fast timing, has been a difficult operating problem between Crewe and Carlisle since its acceleration in May of last year. The Glasgow portion will leave Crewe at 4.52 p.m., as now, continue to call at Lancaster but omit the Penrith stop, and reach Glasgow Central at 9.30 p.m., in 7½ hr. from Euston; the Edinburgh and Aberdeen portions will leave Crewe at 4.58 p.m., call at Lancaster and Penrith, and take up their existing times from Carlisle. The only other changes of remark are the introduction of various summer services at much earlier dates than have been customary hitherto. The Royal Scot will begin its non-stop working on the down journey (calling only at Kingmoor,

Carlisle, to change enginemmen and at Symington to divide, and reaching Glasgow in 7½ hr.) on May 31, but its working will remain unchanged in the up direction; the 10.5 a.m. will therefore begin to run from Euston to Aberdeen independently on May 31 instead of in July. The Lakes Express (12 noon from Euston and 5.10 p.m. into Euston) will begin running daily from May 3 onwards, and the fast advance portion of the Royal Highlander (7.20 p.m. from Euston) on May 31. On the same date the Granite City express will begin running in duplicate from Perth, the first portion calling only at Stonehaven, and reaching Aberdeen at 1.12 p.m., as last summer, in 3 hr. 12 min. from Glasgow; the 10.10 a.m. for Inverness will run independently from Glasgow; and the fast afternoon service of last summer from Glasgow at 4.30 p.m., reaching Inverness at 9.40 p.m., is also reintroduced on May 31. The morning boat service from Larne to Stranraer and the evening service in the opposite direction, are to come into operation daily as early as May 17, with the usual connecting trains to and from Glasgow (the Fast Belfast, reaching St. Enoch at 3.16 and returning at 3.50 p.m.) and Carlisle, with through coaches to and from Euston.

On the London & North Eastern Railway the May timetables contain nothing of remark, and the additional trains are almost without exception those which customarily operate from the beginning of June, and in the commencing date of which no change has been made from previous years.

Institution of Civil Engineers Dinner

The annual dinner of the Institution of Civil Engineers was held at the Guildhall on March 24, with Sir Alexander Gibb, President, in the chair. The Duke of Kent, proposing the toast of "The Institution" referred to the widespread activities of engineers measured by the fact that no less than one-seventh of the working population was occupied in engineering. We had developed, not only a mechanical knowledge and ability in advance of anything known to former generations, but we had also placed engineering on an aesthetic plane. We could admire a machine and call it beautiful, because of its ability to perform a certain work, and we got a real feeling of pleasure in looking at it.

Sir Alexander Gibb, in reply, paid a tribute to the services rendered by members of the Royal Family in the interests of engineering, and especially to the example of the Prince Consort, which had been followed by his descendants. Engineering today was the dominant factor in international relations, since it provided at once all methods of communication, transport,

and the means of defence. It was responsible alike for the comforts and the dangers of modern life.

The Lord Mayor (Sir George Broadbridge), Lord Macmillan, and Lord Snell also spoke.

INSTITUTION OF RAILWAY SIGNAL ENGINEERS.—At a meeting held in London, on March 24, Mr. B. Wagenreider, Associate, read a paper on "Running Signals," dealing with a number of questions arising from the use of different classes of signals and discussing the advantages and disadvantages of various applications of them. The following took part in the discussion: Messrs. A. Moss, F. B. Egginton, T. S. Lascelles, W. H. R. Webb, L. B. Shoppe, H. H. Dyer, S. Williams, J. Holden Fraser, W. Challis, W. J. Sadler, and the President, Mr. H. M. Proud. The next general meeting will be held at the L.N.E.R. Signalling School, York, on April 14, when a paper will be read by Mr. J. Holden Fraser on "The Training of Maintenance Staff for Signal and Telegraph Work."

The "Open Regulator"

Federation of Enginemen's Mutual Improvement Classes Presidential Address

(See editorial note on page 642)

On Sunday, March 21, Mr. L. P. Parker, Divisional Locomotive Superintendent, L.N.E.R., Stratford, delivered his address as President of the Federation of Enginemen's Mutual Improvement Classes. The meeting took place in the lecture theatre of the Science Museum at South Kensington, and the subject chosen was that of "The Open Regulator." The meeting was attended by over 300 representatives from classes on the main line railways, including a few locomotive department officers from different railways.

The President in opening said that one of his own main interests for many years had been the means by which the best possible results could be obtained from any given locomotive, and especially the best methods of handling it by the engineman in order to attain maximum efficiency. It was, he said, quite possible for a man who has had many years on the footplate to use methods which although sufficient to get through the day's work without trouble were still not those which conduced to obtaining the maximum efficiency of the locomotive regarded as a heat engine. The locomotive, he went on to say, has a great capacity for suffering in silence, and methods of driving which are not the best are sometimes revealed only when careful trials are made. It was a source of very considerable satisfaction for an engineman to find himself in full control of so expensive and intricate a piece of machinery as the modern locomotive.

After referring to the experiences of those who handled some of the earliest locomotives, the President went on to say that the correct and proper method of driving the modern locomotive is with full regulator and short cut-off and, moreover, these methods can be used with advantage on many older types of engine for a great part of the work they have to perform. Briefly, the reason for using the full regulator is that by so doing maximum thermodynamic efficiency can be obtained, which in plain English means that as much work as possible is got from the steam.

At this point some interesting lantern slides were shown of locomotive regulator valves in various positions of opening, and when closed, and these served to make clear to those present exactly what happened when the regulator was in the positions commonly referred to as "half-regulator" and "three-quarter regulator," it being demonstrated that these terms are not really correct in that they describe only the position of the handle and not that of the regulator valve itself.

The author then dealt with the effect produced on the pistons at different steamchest pressures, considered in relation to the position of the regulator valve, and remarked, that in his view still further attention would be paid to the streamlining of the inside of the steam passages between the regulator valve and the engine cylinders.

Later, some further slides were shown with the purpose of explaining the principles of expansive working of steam, and the relationship between the steam used and the power developed, and some interesting particulars were afterwards given of results obtained from the different styles of handling the same engine under identi-

cal conditions, and the effect produced on the coal consumption. Towards the close of the address slides were shown of indicator diagrams, attention being drawn to the effects produced by incorrect setting of the valves.

Concluding, the President remarked that the result of the whole of the investigation that afternoon would, he thought, be to confirm his hearers in what, no doubt, was already their usual method, viz., running with the regulator wide open and the valve motion linked up to the point which gives the desired running speed, except where there are special instructions regarding any particular class of engine. If, however, in linking up the valve gear the motion of the engine became irregular it was then correct to change the position a little further from mid-gear until the irregularity in running disappeared, and then to ease the regulator until the desired speed was obtained.

Beyer-Garratt Locomotive Runs Paris-Calais Express

(See editorial note on page 643)

We referred in our issue of March 12 to proposed tests on the Northern Railway of France with two Beyer-Garratt locomotives, the last of an order for twelve destined for the Algerian Railways. These, it will be recalled, were manufactured by the Société Franco-Belge de Matériel de Chemins de Fer in collaboration with Beyer, Peacock & Co. Ltd.

The first of these large 4-6-2 + 2-6-4 express engines has now been under test for several days, being first employed in the Lille district and thereafter transferred to Paris whence several trains have been run to Aulnoye (133½ miles) and Jeumont, the Belgian frontier station (147½ miles). The main purpose of these tests was to try out the suitability of the type for handling the very heavy stopping trains over this section, and for this purpose loads up to 770 tons were taken comfortably to existing timetables. The tests were made on ordinary passenger trains with additional coaches to make up the load. The locomotive demonstrated its capacity to handle these heavy loads without any forcing, and under these conditions 3,200 d.b.h.p. was developed, for instance, with a 690 ton train at 68 m.p.h. On another test, a load of 660 tons was taken up a continuous 1 in 200 at 76 m.p.h.

Owing to the satisfactory performance of the locomotive on the runs already mentioned, the Nord Company decided to make a test on one of the heavy fast non-stop expresses between Paris and Calais, and the 12.15 p.m. ex Paris (Nord) was selected for this purpose. The distance from Paris to Calais is 184 miles and the timing non-stop is 3 hr. 8 min. The maximum speed permitted between Paris and

Amiens, a distance of 81 miles, is 87 m.p.h., on a section equipped with automatic block signalling. From Amiens to Calais, a distance of 103 miles the maximum speed permitted is 75 m.p.h. Various speed restrictions exist, while a special permanent-way restriction at Boves before Amiens called for 18 m.p.h.

The run, which was made on March 23, was solely to test the suitability of this type of engine for continuous high speed, its power having already been amply demonstrated. Therefore no alteration was made to the load offering, which with the addition of a dynamometer car, amounted to 454 tons. The engine was driven by an Algerian driver acquainted with this type of engine, the Nord driver acting as pilot for the road. It might here be recalled that the coupled wheel diameter of this locomotive is 5 ft. 10½ in. (1,800 mm.), as against 6 ft. 2½ in. (1,900 mm.), the usual wheel used on this service, so that the run was experimental in every way.

The locomotive was naturally well within its capacity, but a precautionary stop for water was made at Amiens. Although this amounted to eight minutes, the train nevertheless arrived at Calais two minutes before time, the average speed throughout being 62½ m.p.h. The average speed from Paris to Amiens was exactly 60 m.p.h., while for the 103 miles from Amiens to Calais the average speed was 64½ m.p.h. The run was made, as might be expected from the high power of the locomotive, with the greatest possible ease. The average d.b.h.p. from Paris to Survilliers, 18 miles from Paris, which includes 12 miles continuously uphill at 1 in 200, was 1,700, the 18½ miles being covered in 18½ min. (It

might here be mentioned that on a trial run previous to this test a load of 580 tons was taken to Survilliers with the same ease in 16 min. St. Denis, 3½ miles from the start was passed at 62 m.p.h. on this run, and 75 m.p.h. was quickly reached on the succeeding 1 in 200 rise, requiring an output of about 3,000 d.b.h.p. In the first 58 minutes from Paris 62 miles had been covered, while 66 miles after the stop at Amiens, the train was 11 min. ahead of time. Other points of interest are the topping of the 1 in 133 Dannes Camiers-Neufchatel bank at 61 m.p.h., when a peak of 2,000 d.b.h.p. was registered, and the passing of Caffiers after five miles of 1 in 125 climb, at 58 m.p.h.

These results obviously do not reflect anything like the maximum capacity of the engine; no attempt was made to obtain maximum output, the engine crew being left to themselves with no other instruction than to arrive in Calais on time. The maximum speed on the run did not exceed 82 m.p.h. The run was characterised by the fine stability of the locomotive and the uniform speed, and it was apparent that a considerably greater load could have been taken without difficulty. It might further be observed that the locomotive has run the various trains without being turned, and that no trouble whatsoever has been experienced with bearings, despite the backward running, while the boiler pressure of 285 lb. per sq. in. has been well maintained as well as superheats up to 750° F. The firing was with briquettes.

We understand that the locomotive is now being tested on heavy trains between Paris and Amiens with a Nord driver in control, while the tests will be completed by further runs between Paris and Jeumont and finally runs on the Calais-Basle expresses. On April 20 this first locomotive (No. 11 of the series of twelve) will be shipped from Dunquerque to Algiers. Tests with the second locomotive equipped for oil burning will then begin.

We are informed that the Algerian Railways are about to place an order with the Société Franco-Belge for a further four Beyer-Garratt locomotives similar to the twelve which have just been completed.

ACCIDENTS ON THE RHAETIAN RAILWAY.—On Friday, March 19, the electric locomotive of a train from Schuls-Tarasp to St. Moritz, on the Rhaetian Railway, was derailed owing to a landslide between Zerne and Süs and rolled down a slope and overturned, though the coaches fortunately remained on the track. The driver was killed and another man seriously hurt. The Rhaetian, Furka-Oberalp, Visp-Zermatt, and Lötschberg railways have all had brief interruptions to traffic since the beginning of the year, mainly due to the unusual quantity of snow on the mountains, but previously no loss of life nor damage to stock had been involved.

QUESTIONS IN PARLIAMENT

Co-ordination of Principal Transport Services

Mr. A. G. Walkden (Bristol, S.—Lab.) on March 24 asked the Minister of Transport whether in view of the desirability of having transport facilities organised effectively in readiness for any emergency, he would urge the Traffic Advisory Council to report, without further delay, upon the co-ordination of the principal transport services and the regulation of freight-carrying charges as between roadway and railway undertakings.

Mr. Hore-Belisha (Minister of Transport): I will call the attention of the council to the hon. member's views.

Admission to Underground Railways during Coronation

Mr. Day (Southwark, Central —Lab.) on March 24 asked the Minister of Transport whether, in view of the large crowds that used the underground railway stations on the occasions of the Jubilee procession and the funeral of His late Majesty King George V, and the danger of accidents occurring to persons who might be crowded on to or pushed from the platforms on to the lines, he would consider making representations to the responsible management of the underground railway in order that only a limited number of persons consistent with safety should be allowed on the railway platforms at any one time during the period of the Coronation.

Mr. Hore-Belisha: I will bring the hon. member's question to the notice of the London Passenger Transport Board.

Overcrowding on Suburban Railways

Sir Robert Gower (Gillingham —U.) on March 24 asked the Minister of Transport whether his department had any system under which he could secure regular reports on overcrowding on the suburban railways serving London; and whether, in that case, he would publish a précis of them during the last six months.

Mr. Hore-Belisha: I have no power to call for such reports.

Railway Servants' Superannuation

Mr. Robert Gibson (Greenock—Lab.) on March 25 asked the Minister of Transport what actuarial examinations of the superannuation fund had been made under Section 65 of the Schedule annexed to the London Midland & Scottish Railway (Superannuation Fund) Act, 1924; what was the amount of the deficit shown at each of the said statutory actuarial examinations; if the company had, in respect of such deficits, made to the fund the payments required by Section 7 of the said Act to secure the solvency of the fund; and if he had any statement to make relative to the present position of the fund.

Mr. Hore-Belisha (Minister of Transport) wrote in reply: I have no powers of inspection or otherwise in relation to this matter. The solvency of the fund is guaranteed by the London Midland & Scottish Railway Company, and I understand that the practice of the company is to meet the liability currently upon actuarial advice as to its extent.

Overcrowding on London Railways

Mr. W. T. Kelly (Rochdale—Lab.) on March 25 asked the Minister of Transport if steps would be taken to deal with the overcrowding on the trains of the Underground railways, particularly the line to Hendon and Edgware; and, in view of the London Passenger Transport Board Bill, would action be taken to prevent this dangerous overcrowding becoming worse.

Captain Austin Hudson (Parliamentary Secretary to the Ministry of Transport): I am informed by the London Passenger Transport Board that various new works are in progress, and one of the objects of these is the relief of the Edgware Line. The doubling of the single track and the electrification of the London & North Eastern branch line between Finchley and Edgware, and the running of tube trains over this line via Highgate (upon which traffic today is lighter), will provide a parallel route to the board's existing railway. In addition, the Morden—Edgware line will be equipped with more spacious rolling stock, and when these steps have been carried out it is anticipated that present conditions will be eased.

Mr. Kelly: Will the Minister use his good offices in order to have something done immediately, as there is every likelihood of accidents of a serious nature? If he would take a journey during the rush hours he might find a place on a train, but I doubt it.

Mr. C. G. Emmott (Surrey East—C.): Is the Minister aware that this problem of overcrowding affects a larger area than that mentioned in the question? It forms a subject of complaint so far away as Oxted in Surrey.

Captain Hudson: We do our best in conjunction with the railway companies and the London Passenger Transport Board to meet this difficulty. It is a problem of difficulty.

L.M.S.R. AMBULANCE FINAL.—The following teams will take part in the final of the L.M.S.R. Ambulance Competition at the Winter Gardens, Blackpool, on April 16: Camden Goods (London); Bristol Loco.; Mayfield (Manchester); Crewe (Machine Shop); Wolverton; Crewe (Copper Shop); Accrington (Traffic No. 1 Team); Edge Hill Goods (Liverpool); and Utttoxeter (Staffs).

Staff and Labour Matters

New Railway Wage Claims

In last week's issue of *The Railway Review*, the official organ of the National Union of Railwaymen, Mr. Marchbank, the General Secretary, refers to the increase in gross railway traffic receipts this year; he contends that the figures prove that the railways are participating in the general upward movement of industry and trade. Mr. Marchbank expects that the railways will benefit from the Government's armaments programme and, although increases in railway costs will occur, he believes that railway revenues will benefit very materially from the increase in passenger traffic in connection with the Coronation. He states that "on these very reasonable calculations our union will found its case for the wage claims which will be presented to the companies soon after the Easter holidays." Mr. Marchbank makes a further significant statement; he says "There is nothing sacrosanct in the 1921 standard revenue. We must take things as they are. Abnormal conditions exist. Railway finances in 1921 were different in many respects from the situation which exists now, and cannot be invoked against the railwaymen's claim that the cuts made in 1931 should be terminated now that railway earnings are so definitely in the expansive phase."

Railway Shopmen's New Wage Claims

Following a conference at York on March 18, of the employees' side of the National Railway Shopmen's Council, it is understood that the railway companies will shortly be approached for: the cessation of the 14 per cent. deduction from earnings; the consolidation of the war wage with standard rates of pay; rates of pay to be increased by 1d. an hour with a minimum wage of 50s. a week; a forty-hour working week, without reduction in wages; a guaranteed day; a guaranteed week; and twelve days' annual holiday with pay. The programme is, to say the least, an ambitious one and obviously a very large sum of money is involved in respect of the workshop employees of the four main-line companies, who number approximately 117,000.

Road Transport Hours of Duty

The Industrial Court has been asked to give advice on a joint application from the Omnibus Owners' Association; the Commercial Motor Users' Association; the Associated Road Operators; the Municipal Tramways and Transport Association; the Tramways, Light Railways and Transport Association; the Transport and General Workers' Union; the National Union of Railwaymen, for an Order varying the periods of time prescribed in Section 19 of the Road Traffic Act, 1930, as amended by Section 31 of the Road and Rail Traffic Act, 1933, on the expiration on May

31, 1937, of the Road Traffic Act, 1930 (Variation of Provisions of Section 19) Order 1935 (Public Service Vehicles). The Court heard parties in connection with the application on Wednesday last, March 31.

Road Transport Machinery of Negotiation

We referred in our issue of February 19 to resolutions at the conference of the Bus Federation at Leeds. These resolutions have been approved by the executive committees of the Transport and General Workers' Union and the National Union of Railwaymen and representations have now been made to the Omnibus Owners' Association. One of the objects of the Bus Federation is to secure machinery of negotiation on a national basis for all omnibus employees.

Fair Wages and State Contracts

The Minister of Labour stated in the House of Commons on March 25 that it has been decided to appoint a committee to consider the working of the fair wages resolution of the House of Commons on March 10, 1909, as embodied in Government contracts, and to advise whether any changes are desirable and practicable. The committee will include departmental representatives, and representatives of employers and workpeople selected in consultation with the National Confederation of Employers' Organisations, and the Trades Union Congress General Council, together with an independent chairman.

The fair wages resolution is referred to in Section 93 of the Road Traffic Act (1930), and in Section 32 of the Road and Rail Traffic Act, 1933, in connection with the establishment of "fair wages" of drivers in the road motor industry (goods), and questions have been raised from time to time as to the proper interpretation of the terms of the resolution.

Holidays with Pay

As we forecast in these notes on March 12, the Minister of Labour has now appointed a committee to enquire into the question of holidays with pay. Before the House of Commons rose on Thursday, March 25, Mr. Ernest Brown stated that the terms of reference of this committee are: "To investigate the extent to which holidays with pay are given to employed workpeople, and the possibility of extending the provision of such holidays by statutory enactment or otherwise; and to make recommendations." The Minister went on to say: "I am glad to say that I have been able to obtain the services of Lord Amulree as Chairman. The other members include representatives of employers and workpeople appointed in consultation with the National Confederation of Employers' Organisations, and the Trades

Union Council, and I will publish the full list in the official report. The committee will hold its first meeting as soon as possible after Easter."

The membership of the committee is as follows:—

Lord Amulree, G.B.E., K.C., LL.D. (Chairman). Secretary for Air 1930-31, and President of the Industrial Court 1919-26. He has also been Chairman of numerous important committees and commissions, including the Royal Commission on the Licensing Laws, 1929-31; and the Royal Commission on Newfoundland, 1933.

Mr. Ernest Bevin, Chairman of the Trades Union Congress General Council, and General Secretary of the Transport and General Workers' Union.

Capt. George Deakin, M.C., Chairman of Labour Committee of the National Farmers' Union.

Mr. Charles Dukes, General Secretary, National Union of General and Municipal Workers.

Mr. H. H. Elvin, General Secretary, National Union of Clerks and Administrative Workers.

Lady Findlay, D.B.E.

Mr. J. Hallsworth, Industrial Secretary-General of the National Union of Distributive and Allied Workers.

Mr. George Hicks, M.P., General Secretary, Amalgamated Union of Building Trade Workers of Great Britain and Ireland.

Mr. A. Lyndon Lawrence, member of Management Board of Engineering and Allied Employers' Federation.

Mr. R. M. Montgomery, K.C., Recorder of Chester.

Sir David J. Owen, General Manager, Port of London Authority and President of the National Confederation of Employers' Organisations.

Miss Anne Loughlin, O.B.E., National Officer of the National Union of Tailors and Garment Workers.

Sir Frederick Richmond, Bt., Chairman of Debenhams Limited.

Mr. W. D. Ross, O.B.E., M.A., LL.D., Litt.D., F.B.A., Provost of Oriel College, Oxford.

Mr. W. M. Wiggins, J.P., President of the Federation of Master Cotton Spinners' Association.

Sir Evan Williams, Bt., President of the Mining Association of Great Britain.

Parliamentary Notes

G.W.R. Bill

On the motion for third reading of this Bill in the House of Commons, on March 24, Lord Apsley asked whether the railway company was considering the extension of No. 1 Railway (Denham-Uxbridge) proposed in the Bill to Heston aerodrome, or, if that extension were not to be made, whether there would be a station on Railway No. 1 for Northolt aerodrome. He also asked whether negotiations would be entered into with the Air Ministry with a view to the transfer of the service squadrons now stationed at Northolt to Croydon, which he understood was to be abandoned as a civil airport in favour of Swanley. They would thus be provided with two good air ports, one to the east and one to the west connected by electric trains to the centre of London.

Sir Robert Horne said he had a distinct recollection of certain approaches being made by the Government to the Great Western Railway on the matter which had been raised, and the company had furnished plans. He imagined the Government was still considering the matter.

The third reading was agreed to.

NOTES AND NEWS

Bath Electric Tramways Limited.

—The registered office of this company is now at 1-3, St. Augustine's Place, Tramway Centre, Bristol. Reference to the assumption of the chairmanship by Mr. John F. Heaton is made in our Personal columns, on page 671.

Holiday Seasons for 1937.—Seven-day holiday season tickets (allowing unlimited travel for a week within prescribed areas) are again being issued by the British railways, having been re-introduced on April 1. Wherever possible, lake and river excursions are included among the facilities available to holders of these tickets.

An L.M.S.R. Yorkshire Goods Depot Closed.

—The L.M.S.R. announces that the Middlestown goods and mineral depot, in the West Riding of Yorkshire, was closed for all classes of traffic on March 29. Traffic previously dealt with at Middlestown is now being handled at the L.M.S.R. goods and mineral depot at Horbury and Ossett.

Canadian National Revenue in 1936.

—The net operating revenue of the Canadian National Railways during 1936 was \$15,132,799 (£3,026,500), but after provision for taxes, rentals, and interest payments had been taken into account, a deficit of \$43,303,393 (£8,666,000) resulted; this was, however, \$4,118,070 (£823,600) lower than in the previous year.

L.M.S.R. Boxing Tournament.

—Mr. H. G. Humphreys, District Goods Manager, Manchester, L.M.S.R., presided on March 13 over the second annual boxing tournament promoted by the district. This tournament was founded by Mr. Humphreys, whose silver challenge cup was won this year by the Salford Goods Station team. The cup and replicas were presented by Miss M. G. Humphreys.

L.N.E.R. North Eastern Area Ambulance Competition.

—The Newcastle (Tyne Dock) team won the final competition for the Wharton Shield at Gateshead, on March 20, with a total of 285 points. York (Police) won the Hornsby Ambulance Challenge Cup with 260, and Middlesbrough (Middlesbrough) were third in the competition with 247 points. The awards were presented by Mr. C. M. Jenkin Jones, Divisional General Manager, North Eastern Area, and President of the centre.

Railways Athletic Association.

—The annual five-miles cross-country race organised by the General Committee of this Association took place on March 20, at Enfield Lock. There were 195 entrants, and although this number did not actually line up before Mr. E. E. Painter (R.C.H.), who officiated as starter, there was a great muster of railway athletes. The Individual Championship was won by Mr. E. S. Stimpson (G.W.R., London) with Mr. J. F. Bain (G.W.R., London), second. The L.M.S.R. won the Railway Group Championship with 69 points; the G.W.R. was second, and the L.N.E.R.

third. In the London Area Championship the G.W.R. was first.

Railway Accident in Poland.—On March 25 a passenger train from Katowice to Warsaw collided with a goods train near Rudnicki during a snow storm. Five persons lost their lives and a number of others received injuries.

Electrification and Permanent Way.

—The informal meeting of the Institution of Civil Engineers arranged for Wednesday, April 14, at which Mr. Bruce G. White was to have introduced the subject of "Railway Electrification in Relation to Permanent Way and other Structural Works" has been cancelled.

New L.M.S.R. Stations in South Lancashire.

—A new L.M.S.R. passenger station now in course of construction between Heaton Park and Crumpsall (Manchester and Bury electrified line) is to be named Bowker Vale. Another new L.M.S.R. station is being built between Mossley Hill and Allerton stations, in the Liverpool district, and this will be known as West Allerton.

The "George Inn," Southwark, for the National Trust.

—The famous "George Inn," Southwark, practically the only galleried coaching inn remaining in this country, has been offered by the L.N.E.R. as a gift to the National Trust, on the understanding that the property is preserved, and is continued as an inn. The property has been in the possession of the L.N.E.R. and its predecessors for 13 years. The National Trust has accepted the offer.

L.M.S.R. (London) Musical Society.

—This week (commencing on Wednesday evening) the London Midland & Scottish Railway (London) Musical Society are giving at the Scala Theatre, London, four evening performances of the romantic musical play "Blue Eyes," and a matinee on Saturday. The opening performance on Wednesday evening, which was attended by a number of chief officers of the company, went with a swing and reflected credit on the producer, Mr. Arthur C. Chapman, both as regards the work of the large chorus and the principals. Miss Muriel Noton as "Nancy," Miss Lucy Sander as "Flora Campbell," Miss Constance Clark as "Lady Featherstone," and Mr. Reginald Brockwell as "the Duke of Cumberland," all gave excellent performances as did also the comedian Mr. Fred Bishop as "Henry Horatius Pilbeam," who excelled himself in scene 3 of the second act. The music was provided by Lloyd's Light Orchestra, under the conductorship of Mr. Arthur Waller. Mr. W. E. C. Lazenby, Assistant Chief Officer for Labour and Establishment, is the Chairman, Mr. W. S. Johnson the Vice-Chairman, and Mr. Geo. Gray the Honorary Secretary of the L.M.S. (London) Amateur Musical Society, and all the committee and performers are

to be congratulated on a most successful production. We understand that Sir Josiah Stamp and the Lord Mayor of London and Sheriffs have announced their intention of attending the performance on Saturday evening.

Centenary of John Constable, R.A.

—The centenary of the death of John Constable, R.A. fell on Wednesday last, March 31. To commemorate the famous artist, the L.N.E.R. commissioned Henry Rushbury, R.A., to paint a poster depicting Constable at work on his famous picture of Flatford Mill, and the new work was placed on exhibition throughout the country on the morning of March 31.

Currie's Seeks to Absorb Wordie's at Newcastle.

—Currie & Co. (Newcastle) Ltd. has made application to the Licensing Authority for the Northern Traffic Area to acquire the vehicles and business of Wordie & Co. Ltd., Newcastle base. Currie & Co. Ltd. is an associate of the L.N.E.R., and the L.M.S.R. has a large holding in Wordie & Co. Ltd., the headquarters of which is at Glasgow.

Barrington Light Railway Company.

—The annual general meeting of the company will be held at 47, Belvedere Road, London, S.E.1, at 12 noon, on Thursday, April 8, to receive the directors' report and accounts for the year ended December 31, 1936, for the re-election of directors, auditors, and other officers, and for the conduct of other statutory business as provided for in the Barrington Light Railway Orders. This company, of which the secretary is Mr. N. E. Hoare, is controlled by the firm of Eastwoods Limited, brick manufacturer and barge owner.

G.W.R. Ambulance Presentation at Swindon.

—The annual smoking concert and distribution of ambulance class awards and competition prizes in connection with the Swindon classes took place at the Baths Hall on March 12, when Mr. J. Auld, Principal Assistant to the Chief Mechanical Engineer, presided over a large gathering. Amongst those present were the Mayor of Swindon, Alderman L. J. Newman, and Mr. W. W. Wakefield, M.P., who paid tribute to the efficiency of the division. Mr. Auld referred to the recent admission of Mr. L. G. Bretsch, Divisional Ambulance Secretary, as a Serving Brother of the Order of St. John, and to the velleum vote of thanks of the order which had been awarded to Mr. E. M. Lewis. The presentations, which included trophies and prizes won in the divisional ambulance competitions last month, numbered 402, and were made by Mr. H. V. Slade. Among the recipients was Mr. F. Evans, who received the company's gold medal for 35 years' efficiency, the first such award to be made in Swindon division. Both the Mayor and Mr. Wakefield stressed the voluntary nature of the ambulance movement, and the latter congratulated the division on its 25 per cent. increase in the number of recruits during the past five years.

Model Railway Club Exhibition

The Central Hall, Westminster, is this week the Mecca not only of the model builder but of that large and increasing section of the general public on whom, in varying degrees, the railways have exerted their appeal. The object of this pilgrimage is the Model Railway Club Exhibition. Certainly, even a cursory examination of the stands will convince one that this year there has been no falling off either in the quality or the quantity of the exhibits. Favourite among the younger section of the visitors is the passenger-carrying railway being run by the Society of Experimental and Model Engineers, on which several stunt-heated steeds—this year of N.E. and G.E. ancestry—are performing almost herculean feats of strength, as they snort to and fro with their appreciative freights.

As is customary, separate stands are reserved for groups of L.M.S.R., L.N.E.R., G.W.R. and Southern Railway models. Here can be met new friends and old favourites. Undoubtedly, the most favoured among members' models this year is the G.W.R. The display of locomotives in particular is very representative of Twentieth Century development on this line, and worthy of the railway student's attention. Complete representative trains are an example of the painstaking work of Sir Francis Layland-Barratt, and Messrs. A. C. Johnson, F. W. Hutton-Stott and W. S. Norris.

The constituent companies of the Southern Railway are well represented on the Southern stands, as well as modern types, and even the Isle of Wight Central and Lynton & Barnstaple lines have not been overlooked.

A novelty in the L.N.E.R. section is a descriptive model layout of the new signalling on the Pilmoor—Knaresboro' branch. G.E. and G.W. suburban stock, and Mr. Kerr's G.E. Holden 2-4-2, are other highlights on this stand.

The models of Caledonian stock, and particularly of a "Dunala-stair," and a complete goods trains headed by a Stanier 2-6-0, do much to keep the L.M.S. display up to a high standard. Among foreign models by English makers, those of French

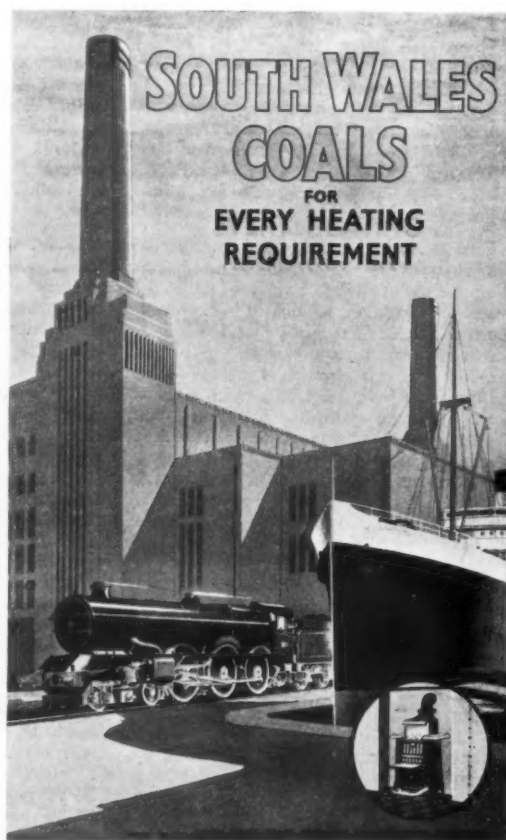
locomotives by Messrs. G. P. Keen and W. E. P. Kelly again attract much attention.

The A.F.A.C. (the French model railway club) show some beautifully finished examples of rolling stock, in some cases the work of French railway apprentices, giving a very fine idea of the trend of modern locomotive and rolling stock development in France. Many examples of free-lance designs show the fertility and ingenuity of the makers.

Among the trade stands, Bassett Lowke Limited has on show an excellent selection of models, including those of L.N.E.R. "Sandringham" class engine, *Arsenal*, and a standard L.M.S.R. 0-6-0 goods engine. THE RAILWAY GAZETTE and associated publications are also represented.

This year the exhibition occupies over twice its previous space, the ground floor hall being now in use for the main body of the exhibits, as well as the basement for working layouts. Previously, the whole exhibition has been accommodated in the basement. An illustration of the exhibits in the hall is reproduced on page 666 this week.

The exhibition is open from 11 a.m. to 10 p.m. until tomorrow, April 3.



A striking poster issued by the South Wales Trade Recovery and Expansion Committee, which is under the chairmanship of Sir Robert Horne, Chairman of the Great Western Railway Company

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices	
			Mar. 31, 1937	Rise/ Fall
G.W.R.				
Cons. Ord. ...	641 ⁴	451 ²	59	+2 ³ ₄
5% Con. Prefce. ...	1261 ²	1163 ⁴	1101 ²	+1
5% Red. Pref. (1950) ...	113	1081 ²	1101 ²	+1
4% Deb. ...	1191 ²	1101 ²	105	+2
4 1/2% Deb. ...	121	114	108	—
4 1/2% Deb. ...	129	121	1141 ²	+1
5% Deb. ...	141	134	1251 ²	+1
2 1/2% Deb. ...	791 ³	74	651 ²	—
5% Rt. Charge ...	1361 ²	130	1211 ²	+1
5% Cons. Guar. ...	1351 ⁴	1273 ⁴	1181 ²	—
L.M.S.R.				
Ord. ...	35 ³ ₈	17	30	+11 ²
4% Prefce. (1923) ...	83	521 ²	75	+3
4% Prefce. ...	923 ⁴	81	83	+2
5% Red. Pref. (1955) ...	1091 ⁴	1031 ⁴	1031 ²	—
4% Deb. ...	1113 ⁴	1059 ¹ ₁₆	102	+1
5% Red. Deb. (1952) ...	119 ³ ₈	1151 ²	1131 ²	—
4% Guar. ...	1063 ⁴	1015 ³	99	+1
L.N.E.R.				
5% Pref. Ord. ...	14	9	10	+1 ²
Def. Ord. ...	71 ⁴	43 ⁴	5	—
4% First Prefce. ...	791 ⁴	551 ⁴	68	+2
4% Second Prefce. ...	317 ⁸	181 ⁴	241 ²	+21 ²
5% Red. Pref. (1955) ...	1001 ²	773 ⁴	91	—
4% First Guar. ...	1041 ²	983 ⁴	931 ²	+1 ²
4% Second Guar. ...	99	90	87	+1 ²
3% Deb. ...	853 ⁴	79	76	+1
4% Deb. ...	1093 ⁴	1041 ²	1001 ²	+1 ²
5% Red. Deb. (1947) ...	1161 ⁴	1101 ²	1071 ² *	—
4 1/2% Sinking Fund Red. Deb. ...	1111 ²	1071 ²	1071 ²	—
SOUTHERN				
Pref. Ord. ...	983 ⁴	821 ²	90	+2
Def. Ord. ...	273 ⁸	213 ⁴	231 ²	+1
5% Pref. ...	1213 ⁴	1181 ²	1081 ²	+1
5% Red. Pref. (1964) ...	1193 ⁴	1151 ⁴	1111 ²	—
5% Guar. Prefce. ...	136	1291 ²	1181 ²	—
5% Red. Guar. Pref. (1957) ...	120	1153 ⁴	1121 ²	—
4% Deb. ...	1173 ¹ ₁₆	1091 ²	1031 ²	+1
5% Deb. ...	140	134	1241 ²	—
4% Red. Deb. 1962-67 ...	1161 ²	110	108	+1
BELFAST & C.D.				
Ord. ...	9	41 ²	4	—
FORTH BRIDGE				
4% Deb. ...	107	105	1021 ²	—
4% Guar. ...	1073 ¹ ₁₆	104	1001 ²	—
G. NORTHERN (IRELAND)				
Ord. ...	191 ²	93 ⁴	*10	—
G. SOUTHERN (IRELAND)				
Ord. ...	63	41	481 ²	—
Prefce. ...	65	46	55	—
Guar. ...	971 ⁴	81	781 ²	—
Deb. ...	993 ⁴	831 ⁴	90	—
L.P.T.B.				
4 1/2% "A" ...	1273 ⁴	121	1131 ²	+1
5% "A" ...	1381 ⁴	1331 ²	1241 ²	—
4 1/2% "T.F.A." ...	1111 ²	1081 ³	106	+1
5% "B" ...	1313 ⁴	1233 ⁴	1191 ²	—
"C" ...	1121 ²	93	90	—
MERSEY				
Ord. ...	403 ⁴	23	331 ²	—
4% Perp. Deb. ...	103	98	99	—
3% Perp. Deb. ...	78	743 ⁸	751 ²	—
3% Perp. Prefce. ...	687 ⁸	631 ⁴	621 ²	—

* ex dividend

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 12th Week				Totals to Date			
	1937		1936		1937		1936	
	Inc. or Dec.		Inc. or Dec.		Inc. or Dec.		Inc. or Dec.	
L.M.S.R. (6,877½ mls.)	£	£	£	£	£	£	£	
Passenger-train traffic...	637,000	420,000	+ 217,000	4,830,000	4,485,000	+	345,000	
Merchandise, &c. ...	428,000	488,000	- 60,000	5,740,000	5,647,000	+	93,000	
Coal and coke ...	256,000	236,000	- 20,000	3,468,000	3,374,000	+	94,000	
Goods-train traffic ...	684,000	724,000	- 40,000	9,208,000	9,021,000	+	187,000	
Total receipts ...	1,321,000	1,144,000	+ 177,000	14,038,000	13,506,000	+	532,000	
L.N.E.R. (6,320 mls.)								
Passenger-train traffic...	381,000	265,000	+ 116,000	3,179,000	2,984,000	+	195,000	
Merchandise, &c. ...	303,000	351,000	- 48,000	3,921,000	3,900,000	+	21,000	
Coal and coke ...	224,000	231,000	- 7,000	3,129,000	3,147,000	-	18,000	
Goods-train traffic ...	527,000	582,000	- 55,000	7,050,000	7,047,000	+	3,000	
Total receipts ...	938,000	847,000	+ 61,000	10,229,000	10,031,000	+	198,000	
G.W.R. (3,738½ mls.)								
Passenger-train traffic...	268,000	167,000	+ 101,000	2,014,000	1,880,000	+	134,000	
Merchandise, &c. ...	183,000	200,000	- 17,000	2,303,000	2,259,000	+	44,000	
Coal and coke ...	112,000	98,000	+ 14,000	1,410,000	1,345,000	+	65,000	
Goods-train traffic ...	295,000	298,000	- 3,000	3,713,000	3,684,000	+	29,000	
Total receipts ...	563,000	465,000	+ 98,000	5,727,000	5,484,000	+	243,000	
S.R. (2,153 mls.)								
Passenger-train traffic...	392,000	256,000	+ 136,000	3,131,000	2,896,000	+	235,000	
Merchandise, &c. ...	52,500	64,000	- 11,500	678,500	719,550	-	41,000	
Coal and coke ...	31,500	31,000	+ 500	411,500	444,530	-	33,000	
Goods-train traffic ...	84,000	95,000	- 11,000	1,090,000	1,161,000	-	71,000	
Total receipts ...	476,000	351,000	+ 125,000	4,222,000	4,060,000	+	161,000	
Liverpool Overhead (6½ mls.)	1,107	1,492	+	14,724	13,305	+	719	
Mersey (4½ mls.)	4,316	4,229	+	50,867	49,689	+	1,778	
*London Passenger Transport Board ...	512,900	556,100	- 13,200	21,770,100	21,167,000	+	603,100	
IRELAND								
*Belfast & C.D. (80 mls.)	1,748	1,761	- 16	20,016	21,812	-	1,786	
pass. goods	5	654	- 649	6,128	6,869	-	741	
total	2,253	2,418	- 165	26,144	28,671	-	2,527	
Great Northern (543 mls.)	10,200	7,300	+ 2,900	94,400	94,700	-	300	
pass. goods	10,850	11,950	- 1,100	111,000	122,150	-	11,050	
total	21,050	19,250	+ 1,800	205,400	216,750	-	11,350	
Great Southern (2,075 mls.)	32,187	26,438	+ 5,749	321,509	323,519	-	2,010	
pass. goods	44,159	47,677	- 3,518	498,949	507,147	-	8,198	
total	76,346	74,115	+ 2,231	820,458	830,666	-	10,208	
				Good Friday, 1937				
				+ 13th week				

Good Friday, 1937

* 39th week

† 13th week

British and Irish Traffic Returns

Totals for 11th Week			Totals to Date			
GREAT BRITAIN			1937	1936	Inc. or Dec.	
	£	£	£	£	£	
L.M.S.R. (6,877½ mls.)	427,000	395,000	32,000	4,193,000	4,065,000	+ 128,000
Passenger-train traffic...	522,000	516,000	6,000	5,312,000	5,183,000	+ 129,000
Merchandise, &c.	326,000	261,000	46,000	3,212,000	3,138,000	+ 74,000
Coal and coke	828,000	766,000	62,000	8,524,000	8,297,000	+ 227,000
Goods-train traffic ...	1,255,000	1,161,000	94,000	12,717,000	12,362,000	+ 355,000
Total receipts ...						
L.N.E.R. (6,320 mls.)	277,000	259,000	18,000	2,798,000	2,719,000	+ 79,000
Passenger-train traffic...	350,000	350,000	—	3,618,000	3,549,000	+ 69,000
Merchandise, &c.	264,000	249,000	15,000	2,905,000	2,916,000	- 11,000
Coal and coke	614,000	599,000	15,000	6,523,000	6,465,000	+ 58,000
Goods-train traffic ...	891,000	858,000	33,000	9,321,000	9,181,000	+ 137,000
Total receipts ...						
G.W.R. (3,738½ mls.)	170,000	162,000	8,000	1,746,000	1,713,000	+ 33,000
Passenger-train traffic...	206,000	201,000	5,000	2,120,000	2,059,000	+ 61,000
Merchandise, &c.	122,000	105,000	17,000	1,298,000	1,247,000	+ 51,000
Coal and coke	328,000	306,000	22,000	3,418,000	3,306,000	+ 112,000
Goods-train traffic ...	498,000	468,000	31,000	5,164,000	5,019,000	+ 145,000
Total receipts ...						
S.R. (2,153 mls.)	261,000	251,000	9,000	2,739,000	2,640,000	+ 99,000
Passenger-train traffic...	62,500	66,500	4,000	626,000	655,500	- 29,500
Merchandise, &c.	31,500	32,500	2,000	380,000	413,500	- 33,500
Coal and coke	97,000	99,000	2,000	1,006,000	1,069,000	- 63,000
Goods-train traffic ...	357,000	350,000	7,000	3,745,000	3,709,000	+ 36,000
Total receipts ...						
Liverpool Overhead (64 mls.)	1,150	1,018	132	12,917	12,213	+ 704
Passenger-train traffic...	4,403	4,043	360	46,551	44,869	+ 1,681
Mercy (4½ mls.)	559,630	546,300	13,330	21,227,200	20,610,900	+ 616,300
* London Passenger Transport Board ...						
IRELAND						
†Belfast & C.D. (80 mls.)	1,677	1,833	186	18,268	20,038	- 1,770
Pass. goods	489	6,9	120	5,623	6,215	- 592
Goods total	2,166	2,472	3,6	23,891	26,253	- 2,362
Great Northern (54½ mls.)	8,750	9,250	500	84,200	87,400	- 3,200
Pass. goods	8,850	10,400	1,550	100,150	110,100	- 9,950
Goods total	17,650	19,650	2,050	184,350	197,500	- 13,150
Great Southern (2,075 mls.)	28,908	31,532	1,624	289,322	297,081	- 7,759
Pass. goods	37,740	40,533	2,793	454,790	459,470	- 4,680
Goods total	66,648	71,165	4,417	744,112	756,551	- 12,439

† 12th week

* 38th week

CONTRACTS AND TENDERS

The Hunslet Engine Co. Ltd. has received orders during the past month for diesel locomotives totalling 700 h.p. in addition to a number of industrial steam locomotives.

Locomotives for India

The Skoda Works, through Carters (Merchants) Limited, has received an order from the Bengal & North Western Railway for four YB class metre-gauge superheated 4-6-2 passenger locomotives and tenders, to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

F. Morton & Co. Ltd. has received an order from the Nyasaland Railways for a quantity of steelwork required for extension to locomotive running sheds of workshops.

J. Baker & Bessemer Limited has received an order from the Buenos Ayres Western Railway for 750 locomotive tyres.

The New Zealand Government Railways have placed orders for equipment with the following firms :—

J. Stone & Co. Ltd.: Electric train lighting equipment (£26,771).

Metropolitan-Cammell Carriage & Wagon Co. Ltd.: 1,200 wagon sides, and plates, &c. (£20,400).

Owen & Dyson Limited: Rolled steel disc wheels (£8,448).

Flexo Plywood Industries Limited: Steel and copper-faced plywood for car bodies (£15,060, together with £2,600 for panels).

Tucker Armoured Plywood Co. Ltd.: Metal-faced plywood (£3,600, of which £2,000 is for aluminium panels).

The British Thomson-Houston Co. Ltd. has secured a twelve-months' contract for Mazda lamps from the L.N.E.R.

Taylor Bros. & Co. Ltd. has received an order from the Central Argentine Railway for 100 solid rolled steel wheels for tender bogies.

Metropolitan-Vickers Electrical Co. Ltd. has received orders from the L.M.S.R., Northern Counties Committee, for the supply of Cosmos electric lamps for the 12 months ending February 28, 1938.

The War Office has placed orders for six four-wheeled explosive vans with R. Y. Pickering & Co. Ltd., and 10 four-wheeled covered goods wagons with Metropolitan-Cammell Carriage & Wagon Co. Ltd.

The Consolidated Brake & Engineering Co. Ltd. has received an order from the Central Argentine Railway for vacuum brake equipments required for 300 motor-car vans.

The Canadian Pacific Railway announces the projected expenditure of over \$20,000,000 on new equipment in 1937, including 50 locomotives, 3,600 freight cars, and 30 passenger cars, states Reuters. Contracts have been awarded to the National Steel Car Company, the Canadian Car and Foundry Company, and the Canadian Locomotive Company.

The Royal Hungarian State Iron, Steel & Machine Works has received an order through Shaw, Wallace & Co. for the supply of 150 superheated locomotive boilers, required for the Great Indian Peninsula Railway.

Guest, Keen, Williams Limited has received an order from the Indian Stores Department for 300 tons of mild steel rounds at a total price of Rs. 49,125.

The Electro Motive Corporation, states Reuters Trade Service, has received an order from the Atchison, Topeka & Santa Fé Railway for one streamlined 3,600-h.p. diesel locomotive.

Colonial Wagon Orders

The Crown Agents for the Colonies have recently placed the following orders :—

For the Nigerian Railway: Birmingham Railway Carriage & Wagon Co. Ltd., 50 underframes and bogies for covered goods wagons, and 14 bogie covered goods wagons.

For the Federated Malay States Railways: Birmingham Railway Carriage & Wagon Co. Ltd., 5 carriage underframes and bogies.

For the Kenya and Uganda Railways: Metropolitan-Cammell Carriage & Wagon Co. Ltd., 193 four-wheeled covered goods wagons, and 24 four-wheeled cattle wagons.

The Chinese Government Purchasing Commission has placed the following orders to the inspection of Messrs. Fox & Mayo, for equipment required for the Canton-Hankow Railway :—

Tangyes Limited, two steam-driven duplex double-acting ram pumps.

D. Mitchell & Co. Ltd., one 7½-in. centre engine lathe.

Churchill Machine Tool Co. Ltd., one universal grinding machine.

George Richards & Co. Ltd., one side-head type vertical boring and turning mill.

Metropolitan-Vickers Electrical Co. Ltd., one 400 kVA. transformer.

Steel Peech & Tozer Limited, has received an order from the Madras & Southern Mahratta Railway to the inspection of Messrs. Rendel, Palmer & Tritton, for 12 locomotive straight axles.

Stork Bros. N.V., of Hengelo, has received an order from the Netherlands Railways for 26 Stork-Ganz oil engines of 85 b.h.p. for installation in locomotors. There are already 84 of these Stork-Ganz engines in service on, or on order for the same railway.

Barclay, Curle & Co. Ltd. has received an order from the Bengal & North Western Railway, to the inspection of Messrs. Rendel, Palmer & Tritton, for one steam engine driven generating set and switchboard required for the P.S. Muzaffarpur.

D. Wickham & Co. Ltd. has received orders from the South African Railways & Harbours Board for 32 motor saloon

inspection railcars, comprising seven narrow-gauge and 25 South African standard 3 ft. 6 in. gauge. Six of these railcars will be fitted with Austin engines and 26 with 24-h.p. Ford engines.

Hurst Nelson & Co. Ltd. has received an order from the Rhodesia Railways, to the inspection of Sir Douglas Fox and Partners, for 18 bogie petrol tank wagons of 7,000 gal. capacity, and 9 bogie fuel-oil tank wagons of 6,000 gal. capacity. All are fitted with ring spring draught gear.

Tenders are invited by the Bengal & North Western Railway, receivable by April 13 at 237, Gresham House, Old Broad Street, London, E.C.2, for the supply of nine third-class bogie coaches with Sheffield-Twinberrow bogies.

Tenders are invited by the South Indian Railway Administration, receivable by April 5 at 91, Petty France, Westminster, S.W.1, for the supply of pressed-steel sleepers and solid-drawn steel boiler tubes.

Railway and Other Reports

Cordoba Central Railway.—Although the net income for the first eight months of the current financial year shows some improvement, the company is still unable to resume the payment of interest on its 4½ per cent. first debenture stock. The board has therefore decided, with the concurrence of the trustees and the debenture stockholders' committee, to postpone until October 1, 1937, or until such later date as may with the like concurrence hereafter be determined, payment in full of the half-yearly instalments of interest on the company's first debenture stock which fell due on or between October 1, 1934, and October 1, 1936, as well as of the further half-year's instalment of such interest which falls due on April 1, 1937.

Associated Electrical Industries Limited.—The profit for the year 1936, after deduction of all expenses and charges other than depreciation and income tax is £1,055,624, an increase of £227,105 on 1935. Depreciation takes £149,574, against £91,832, and income tax £267,574, against £179,674, leaving a balance of £638,476, an improvement of £102,618. Adding £165,405 brought forward makes the total profit available for distribution £803,881. Sums are appropriated of £100,000 (against nil) to general reserve and of £75,000 (against nil) to writing off patents and goodwill. Dividends for the year on the 8 per cent. cumulative preference stock and shares take £77,473, and the directors propose a dividend of 10 per cent. for the year (less tax) on the ordinary stock and shares, absorbing £375,290, and leaving £176,118 to be carried forward. The dividend for 1935 was 8 per cent. All the company's works continued to be well employed during the year. Orders received during 1936, as well as orders in hand at December 31 last, showed a substantial increase over those for 1935.

The Bengal & North Western Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of:—
NINE 3RD CLASS BOGIE CARRIAGES WITH SHEFFIELD TWINBERROW BOGIES as per Specification to be seen at the Company's Offices.

Tenders addressed to the undersigned, and envelope marked "Tender for Carriages," with name of firm tendering, to be lodged not later than Noon on the 13th day of April, 1937.

For each Specification a fee of £1 will be charged, which cannot, under any circumstances, be returned.

The Directors do not bind themselves to accept the lowest or any Tender.

By Order of the Board,
J. WILLIAMSON,
Managing Director.

237, Gresham House,
Old Broad Street,
London, E.C.2.
18th March, 1937.

Sudan Government

SUDAN RAILWAYS require a District Traffic Manager, not over 25 years of age, unmarried, holding a University Honours Degree, with experience in traffic working on an English or Overseas Railway.

Applications will be considered at the end of April, 1937, and the successful candidate will be required to leave for the Sudan on a date to be decided upon later.

The initial salary is £E480 per annum. (£E1 = £1 0s. 6d.) Free passage on appointment. Strict medical examination.

After a probationary period of service the successful candidate would be eligible for appointment to the permanent service with progressive increases of pay in accordance with the scales for officials in the Government Service.

Applications, giving full particulars of qualifications, experience and age, with copies of testimonials, should be sent to the Controller, Sudan Government, London Office, Wellington House, Buckingham Gate, London, S.W.1, marking envelope "D.T.M."

Forthcoming Events

- Mar. 30-Apr. 3.—Model Railway Club Exhibition, at Central Hall, Tothill Street, London, S.W.1.
- Apr. 2 (Fri.).—Institute of Transport (Leeds), at Town Hall, 6.30 p.m. Annual General Meeting.
- Institute of Transport (Manchester-Liverpool), at Exchange Station Hotel, Liverpool, 6.30 p.m. "The Coasting Trade—Modern Development and Trend," by M. A. Robinson.
- Apr. 5 (Mon.).—Society of Engineers, at Geological Society, Burlington House, Piccadilly, London, W.1, 6 p.m. Presidential Address by Mr. B. Tarring.
- Apr. 6 (Tues.).—Institute of Transport (Birmingham Graduate), at Imperial Hotel, 6.30 p.m. Annual General Meeting.
- Institute of Transport (Metropolitan Graduate), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 6 p.m. "Long Distance Goods Road Transport Operation," by Mr. E. Davis.
- Institution of Automobile Engineers, at Royal Society of Arts, John Street, London, W.C.2, 7.45 p.m. "The Silencing of Gas Noises for all Classes of Vehicles," by Wing-Commr. T. R. Cave-Browne-Cave, C.B.E.
- Railway Benevolent Institution, at Connaught Rooms, Great Queen Street, London, W.C.2, 6.45 p.m. for 7.15 p.m. Anniversary Dinner.
- Apr. 8 (Thurs.).—Institute of Metals (London), at Society of Motor Manufacturers, 83, Pall Mall, S.W.1, 7.30 p.m. Annual General Meeting.
- Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "Minor Mishaps—Cause and Effect," by Mr. C. Anderson.
- Southern Railway (London) Lecture and Debating Society, at Chapter House, St. Thomas' Street, S.E.1, 5.45 p.m. "Trans-

OFFICIAL NOTICES

Sudan Government

SUDAN RAILWAYS require the services of Three Traffic Inspectors, age 22-25, preferably single. Candidates must have several years' experience in the traffic clerical side of a railway in this country, together with knowledge of shorthand and typing.

Scale of pay £E400 per annum, rising to £E700 over a period of 15 years. (£E1 = £1 0s. 6d.) Provident Fund benefits on termination of contract according to terms of Sudan Provident Fund Ordinance. Free passage on appointment. Strict medical examination.

Applications, giving full particulars of age, qualifications and experience, with copies of testimonials, should be sent to the Controller, Sudan Government London Office, Wellington House, Buckingham Gate, London, S.W.1, marking envelope "Traffic Inspector."

CIVIL ENGINEER, 31, married, B.Sc. 1st Hons. (Glasgow), A.M.Inst.C.E., 3 years' apprenticeship with good general civil engineering training, eight years with British-owned railway abroad with very general experience, including administration, maintenance, bridge testing, water, &c., &c. Fluent Spanish and knowledge of French. Intelligent hard worker. Holds high position at present, but salary unsatisfactory as company still retrenching. Excellent references. Requires position with prospects, preferably abroad, South Africa, &c. Free and in England July this year. Present reply will take about two months.—Box No. 7, c/o THE RAILWAY GAZETTE, 33, Tothill Street, London, S.W.1.

Central Argentine Railway Limited

NOTICE IS HEREBY GIVEN that the Transfer Books of the 5 per cent. Redeemable Debenture Stock of the Company will be closed on 1st April, 1937, for one day only, for the preparation of warrants for interest for the half-year ending 30th April, 1937.

RONALD LESLIE,
London Manager and
Secretary.

31, Coleman Street,
London, E.C.2.
23rd March, 1937.

Royal State Railways of Siam

NOTICE.

SEALD Tenders for the supply of various types of Rolling Stock will be received by the Superintendent of Stores, Royal State Railways of Siam, Bangkok, Siam, up to 14.00 o'clock on the 30th July, 1937, at which hour and date they will be publicly opened in the Superintendent of Stores' Office.

Blank Tender Forms are obtainable from Messrs. SANDBERG, 40, Grosvenor Gardens, London, S.W.1, and 25, Broadway, New York City, at the price of £5 and U.S. \$25.00 per set respectively.

THE ADMINISTRATION ROVAL
STATE RAILWAYS.

ASSISTANT wanted for firm of Railway Engineers for India. Age 22 to 25, unmarried. Railway training in the mechanical departments essential. Apply giving details of training to Box 31, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, S.W.1.

South Indian Railway Company, Limited

THE Directors are prepared to receive Tenders for the supply of:—

STEELWORK FOR BRIDGES
(Thirteen 150 ft. through spans)

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company, Limited, marked "Tender for Bridgework," with the name of the firm tendering must be left with the undersigned not later than 12 noon, Wednesday, the 28th April, 1937.

The Directors do not bind themselves to accept the lowest or any tender.

A charge, which will not be returned, will be made of £1 for each copy of the Specification.

Copies of the Drawings may be obtained at the Offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, S.W.1.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
31st March, 1937.

- port and the Development of Greater London, 1800-1936," by Mr. F. Wymer.
- Apr. 9 (Fri.).—Institute of Transport (Newcastle), at Royal Station Hotel, 7.30 p.m. Annual General Meeting.
- Institute of Transport (Newcastle Graduate), at Royal Station Hotel, 6 p.m. Annual General Meeting.
- Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, 6 p.m. Symposium of Papers on Special Aspects of the Use of Steam for Process Work.
- Apr. 10 (Sat.).—Permanent Way Institution (Birmingham). "Modern Signalling in Relation to the Permanent Way," by Mr. O. S. Nock.
- Permanent Way Institution (Manchester-Liverpool). Visit to Leyland Motor Works.
- Apr. 12 (Mon.).—Engineers' German Circle, at Inst. of Mechanical Engineers, Storey's Gate, London, S.W.1, 6 p.m. "The Elec-

- trification of the Tirol Alps Railways," by Herr Oberbaurat Ing. R. Wolf.
- Institute of Transport (London), at Inst. of Electrical Engineers, Savoy Place, W.C.2, 5.30 p.m. "Recent Developments in Ocean Transport," by Sir Thomas Royden.
- Stephenson Locomotive Society (London), at L.N.E.R. Dining Club, King's Cross Station, N.1, 6.30 p.m. Discussion.
- Apr. 13 (Tues.).—Federation of British Industries, at Grosvenor House, Park Lane, London, W.1, Annual Dinner.
- Institute of Transport (Birmingham), at Queen's Hotel, 6 p.m. Annual General Meeting.
- Apr. 14 (Wed.).—Diesel Engine Users' Association, at Caxton Hall, Caxton Street, London, S.W.1, 4.45 p.m. Informal Discussion on Draft Bulletin dealing with the Development of the Diesel Engine in all its Aspects during 1936.

Exports of Railway Material from the United Kingdom in February

	Two Months Ending			
	Feb., 1937	Feb., 1936	Feb., 1937	Feb., 1936
Locomotives, rail	157,180	138,162	287,164	236,750
Carriages and wagons	177,469	136,161	348,370	259,115
Rails, steel	53,401	87,010	198,214	125,891
Wheels, sleepers, fishplates and miscellaneous materials	86,872	43,864	170,742	80,526

Locomotive and rail exports included the following:—

	Locomotives		Rails	
	Feb., 1937	Feb., 1936	Feb., 1937	Feb., 1936
Argentina	6,905	6,105	2,032	2,771
Union of South Africa	—*	—*	30,978	20,552
British India	10,715	19,463	6,505	9,777

* Figures not available.

Railway Share Market

Despite further excellent traffic receipts, Home railway stocks have not maintained the improved tendency which developed last week. Sentiment has again come under the influence of the possibility of increased wages, as it is realised that the question of more satisfactory dividends on the junior stocks for the current year will turn very largely on this. Nevertheless, if traffics continue to make an encouraging showing, the junior stocks will be expected to show response, particularly as in most cases quite favourable yields are offered at present prices.

It had been expected that the traffics of the four main lines would show an increase of between £350,000 and £450,000, as they cover Good Friday week and compare with an ordinary week in 1935. The total increase proves to have been £461,000, which brings the aggregate gain for the current year to

date up to £1,134,000. For the past week the L.M.S.R. was able to show an increase of £177,000, but the ordinary stock failed to respond strongly and is around 30½, while the 4 per cent. preference and 1923 preference were 83 and 75 respectively. Southern deferred was firmer on Wednesday at 23½, as was the preferred at 89½, the traffic gain for the past week being £125,000, the largest increase reported by the railway for some considerable time. Great Western failed to respond to the rise of £98,000 in last week's receipts and L.N.E.R. first and second preference remained dull at 68 and 25 respectively, the traffic gain of £61,000 being below market expectations. Debentures and guaranteed issues were inclined to show a firmer tendency owing to the stronger trend in British Government stocks. London Transport "C" was dull at 90½.

Rather lower prices ruled for Argentine railway preference stocks, but the ordinary stocks were fairly steady, particularly B.A. Great Southern, which was assisted by the possibility of dividends being resumed for the current year, although this is not generally expected and not more than 1 per cent. would seem possible. Debenture stocks made fractional gains, including Cordoba Central first debentures, which have been in better demand on the view that they appear rather moderately valued on the basis of the terms whereby the Argentine Government proposes to purchase the line. Elsewhere, San Paulo and Leopoldina made lower prices, sentiment having been affected by the Brazilian Government debt arrangements, although they do not, of course, apply to the stocks of the railways. Canadian Pacific ordinary and preference were better.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

Railways	Miles open 1936-37	Week Ending	Traffics for Week		No. of Weeks	Aggregate Traffics to Date			Shares or Stock	Prices						
			Total this year	Inc. or Dec. compared with 1936		Totals		Increase or Decrease		Highest 1936	Lowest 1936	Mar. 31, 1937	Yield % (See Note)			
						This Year	Last Year									
South & Central America.	Antofagasta (Chili) & Bolivia	834	28.3.37	£ 16,110	+	£ 5,020	13	207,670	£ 177,110	+	£ 30,560	Ord. Stk.	25	151½	26	Nil
	Argentine North Eastern	753	27.3.37	8,387	+	1,184	39	338,987	303,209	+	35,778	"	12	2	11	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	—	—	A. Deb.	54	45	93	45½
	Bolivar	174	Feb., 1937	5,700	—	950	9	11,100	12,150	—	1,050	6 p.c. Deb.	9	5	81½	3
	Brazil	—	—	—	—	—	—	—	—	—	—	Bonds.	16	11½	161½	Nil
	Buenos Ayres & Pacific	2,806	27.3.37	125,248	+	23,662	39	3,535,030	3,206,445	+	328,585	Ord. Stk.	1712	6	14	Nil
	Buenos Ayres Central	190	27.2.37	\$157,200	+	\$75,600	35	\$5,080,000	\$4,015,400	+	\$1,064,600	Mt. Deb.	3112	11	38	Nil
	Buenos Ayres Gt. Southern	5,084	27.3.37	192,618	+	34,040	39	5,804,919	5,119,075	+	683,844	Ord. Stk.	3134	13½	34	Nil
	Buenos Ayres Western	1,930	27.3.37	56,514	+	9,569	39	1,884,444	1,732,870	+	151,574	"	2934	11	29	Nil
	Central Argentine	3,700	27.3.37	165,720	+	58,082	39	5,932,366	4,694,993	+	1,237,373	"	32932	8½	32	Nil
	Do.	—	—	—	—	—	—	—	—	—	—	Dfd.	21	4½	17	Nil
	Cent. Uruguay of M. Video	273	20.3.37	11,958	+	322	38	471,594	411,549	+	60,045	Ord. Stk.	754	3	11	Nil
	Do. Eastern Extn.	311	20.3.37	2,848	+	588	38	8,406	77,028	+	11,378	"	—	—	—	—
	Do. Northern Extn.	185	20.3.37	1,701	—	69	38	61,287	53,823	+	7,464	"	—	—	—	—
	Do. Western Extn.	211	20.3.37	968	+	185	38	39,447	33,709	+	5,738	"	—	—	—	—
	Cordoba Central	1,218	27.3.37	26,300	+	2,090	39	1,230,140	1,106,070	+	124,070	Ord. Inc.	5	1	5½	Nil
	Costa Rica	188	Jan., 1937	14,174	+	2,616	31	125,108	92,279	+	32,829	Stk.	3612	32	37	5½
	Dorado	70	Feb., 1937	15,800	+	3,500	9	31,100	2,600	+	5,500	1 Mt. Db.	107	101½	104½	5½
	Entre Rios	810	27.3.37	10,875	+	2,597	39	505,618	425,344	+	80,274	Ord. Stk.	17	6	16	Nil
	Great Western of Brazil	1,082	27.3.37	6,300	—	1,800	13	108,100	126,100	—	18,000	Ord. Sh.	12	5½	12	Nil
	International of C. Amer.	794	Jan., 1937	\$516,579	+	\$15,044	5	\$516,579	\$501,535	+	\$15,044	"	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	—	—	1st Pref.	1	2	16	Nil
	La Guaira & Caracas	224	Feb., 1937	4,925	+	700	9	11,195	8,650	+	2,545	Stk.	9	3	7½	Nil
	Leopoldina	1,918	27.3.37	22,988	+	3,786	13	281,541	230,537	+	51,004	Ord. Stk.	1012	31½	7	Nil
Mexican	483	21.3.37	\$366,100	+	\$106,500	12	\$3,550,700	\$1,925,000	+	\$625,700	"	114	14	114	Nil	
Midland of Uruguay	319	Feb., 1937	8,320	+	26	36	69,193	57,159	+	12,034	"	112	14	12	Nil	
Nitrate	397	15.3.37	8,511	+	1,896	11	38,301	35,969	+	2,333	Ord. Sh.	63/6	41/9	29½	Nil	
Paraguay Central	274	20.3.37	\$3,508,000	+	\$590,000	38	\$102,198,000	\$85,982,000	+	\$16,216,000	Pr. Li. Stk.	85	71	81	7	
Peruvian Corporation	1,059	Feb., 1937	74,301	+	4,339	35	614,887	616,056	+	28,831	Pref.	15	9	12½	Nil	
Salvador	100	20.3.37	\$39,750	+	\$14,600	38	\$850,008	\$723,746	+	\$128,262	Pr. Li. Db.	18	16	22½	Nil	
San Paulo	153½	21.3.37	31,183	+	6,599	12	344,776	329,293	+	14,983	Ord. Stk.	86	46½	96½	29½	
Taltal	164	Feb., 1937	3,440	—	1,130	35	27,930	28,485	—	5	Ord. Sh.	115½	14½	11½	8½	
United of Havana	1,353	27.3.37	58,389	+	13,762	39	986,837	877,838	+	108,999	Ord. Stk.	314	1	4½	Nil	
Uruguay Northern	73	Feb., 1937	865	+	61	36	8,461	6,528	+	1,933	Deb. Stk.	5	3	9	Nil	
Canada.	Canadian National	23,566	21.3.37	722,981	+	76,238	12	7,883,361	7,143,437	+	739,924	"	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—	—	—	Perp. Dbs.	76	51	70	51½
	Grand Trunk	—	—	—	—	—	—	—	—	—	—	4 p.c. Gar.	10454	993½	95½	47½
	Canadian Pacific	17,223	21.3.37	517,000	+	44,800	12	5,531,800	5,203,800	+	328,000	Ord. Stk.	1654	101½	15½	Nil
India & Far East.	Assam Bengal	1,329	28.2.37	31,132	—	3,281	46	1,224,978	1,165,144	+	59,834	Ord. Stk.	8734	821½	741½	4
	Barsi Light	202	28.2.37	2,640	—	982	46	105,158	131,250	—	28,092	Ord. Sh.	7712	651½	60	85½
	Bengal & North Western	2,107	28.2.37	81,664	+	4,717	20	1,208,203	1,163,938	+	44,265	Ord. Stk.	319	292½	312	5½
	Bengal Doonars & Extension	161	10.3.37	2,996	—	7	47	123,108	132,583	—	9,475	"	12712	118	101½	5½
	Bengal-Nagpur	3,268	10.3.37	210,450	+	22,995	47	5,794,076	6,100,061	—	305,985	"	104	100½	94½	4½
	Bombay, Baroda & C. India	3,072	20.3.37	239,175	+	22,050	48	8,650,725	8,124,525	+	526,200	"	114	110½	111½	5½
	Madras & Southern Mahratta	3,229	28.2.37	119,550	—	17,207	46	5,089,204	4,925,162	+	164,042	"	116½	108½	105½	7½
	Rohilkund & Kumaon	572	28.2.37	15,708	—	1,927	20	237,726	230,023	+	7,703	"	311	286	313	5½
	South Indian	2,532	20.2.37	107,177	+	5,631	45	3,565,887	3,493,513	+	72,374	"	10712	102½	101½	5½
Various.	Beira-Umtali	204	Jan., 1937	62,738	+	1,539	17	268,806	254,392	+	14,414	"	—	—	—	—
	Bilbao River & Cantabrian	15	Feb., 1937	1,646	—	506	9	2,682	3,470	—	788	"	—	—	—	—
	Egyptian Delta	620	10.3.37	7,269	+	1,071	47	241,286	238,093	+	3,193	Prf. Sh.	214	18	19½	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	—	—	Inc. Deb.	112	1	3½	Nil
	Kenya & Uganda	1,625	Feb., 1937	274,358	+	24,224	9	563,494	483,510	+	79,984	"	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	—	—	B. Deb.	5012	37	46	7½
	Mashonaland	913	Jan., 1937	116,140	+	18,269	17	489,820	410,904	+	78,916	1 Mg. Db.	10112	1015½	107	41½
	Midland of W. Australia	277	Jan., 1937	12,814	—	2,014	31	94,868	98,451	—	3,583	Inc. Deb.	97	93½	96	4½
	Nigerian	1,905	6.2.37	71,903	+	18,194	45	2,106,058	1,633,264	+	472,794	"	—	—	—	—
	Rhodesia	1,538	Jan., 1937	210,786	+	30,327	17	875,434	756,444	+	118,990	4 p.c. Db.	107	103½	109	31½
	South Africa	13,263	6.3.37	618,870	+	40,315	49	29,841,591	27,990,878	+	1,850,713	"	—	—	—	—
	Victoria	4,728	Nov., 1936	868,988	+	45,953	21	3,995,540	3,959,297	+	36,243	"	—	—	—	—
Zafra & Huelva	112	Jan., 1937	15,881	+	5,393	4	15,881	10,488	+	5,393	"	—	—	—	—	

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1%.
 † Receipts are calculated @ 1s. 6d. to the rupee. ‡ Ex dividend. Salvador and Paraguay Central receipts are in currency.
 The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value.

Electric Railway Traction

Occurrences in Lancashire

LANCASHIRE, and the Merseyside district in particular, appear to be on the threshold of electric traction extensions and modifications. In the first place, the L.M.S.R. has decided to close its 21,500 kW. steam power station at Formby, which supplies current to the Liverpool—Southport line. This plant was erected by the Lancashire & Yorkshire Railway in 1904, and was enlarged in 1906 and 1912 before a more thorough modernisation in 1922-24. Arrangements are being made for the necessary energy to be supplied from the generating station belonging to the Liverpool Corporation, and it is expected that the change-over will be made during the summer. At the moment it is intended that the Liverpool plant will supply also the current for the L.M.S.R. Wirral lines now in course of conversion, but the Birkenhead Corporation has appealed to the High Court of Justice against the Ministry of Transport's authorisation order, which was backed by a decision of the Electricity Commissioners, on the grounds that it not competent for the Liverpool Corporation to supply energy in the Birkenhead Corporation's supply area. Regarding the Southport electrified lines, it is extremely probable that the very logical extension will be made from Ormskirk through Birsough junction to Southport, providing an alternative electric route to Southport and giving opportunities for the more efficient use of the rolling stock. It is possible, too, that an extension may be made from Walton junction and Aintree to Wigan, but if such an extension were sanctioned it could be regarded only as the first stage of a Liverpool—Manchester conversion. The trouble in this part of Lancashire is that the railway network is so dense that it is difficult to know where to stop when an electrification scheme is being considered, and the problem is rendered more delicate by the fact that each town is shouting hard for an electric service, and whatever the routes ultimately are decided on by the L.M.S.R. as being most suitable for electrification first, there is sure to be an outcry from the towns left out. It is to be hoped that the L.M.S.R. will take the bit between its teeth and adopt a bold policy of extensive conversion. On traffic density alone, there are numerous interurban routes in the Manchester area where electrification would be justified, even allowing for the complications of steam-worked goods trains.

Italian Electrification Costs

THE locomotive coal consumption on the Italian State Railways during the last fiscal year totalled 1,943,000 tons and the cost was £2,020,000. The length of line then electrified amounted to about 2,085 miles, and the consumption of energy was 617,100,000 kWh. at a cost of £1,020,000. If these lines had been worked by steam traction they would have required 1,040,000 tons of coal costing £1,080,000, of which at least £915,000 would have been paid for imported coal. Thus, although the saving in actual cash is not large, it has meant a much greater use of Italy's own resources. It will be seen that the cost of coal is approximately

20s. 9d. per ton and the cost of electric power about 0.4d. per kWh. Other lines for which financial appropriations have been sanctioned, or on which conversion is actually under way, total about 1,790 miles; the estimated power consumption for these routes is 546,000,000 kWh., which will replace a steam locomotive coal consumption of 925,000 tons. It is not known whether there will be any measurable reduction in the price per unit of energy when the new schemes are completed. Practically all the new electrifications will be on the 3,000-volt d.c. system, and the estimated cost is given as £6,650 per mile (at the rate of 94 lire to the £), exclusive of locomotives and rolling stock. Elsewhere in this issue it is indicated that on the 3,000-volt d.c. system of the South African Railways the cost of electrification is only about £2,400 per route mile or £1,400 to £1,500 per track mile. Inclusive of electric locomotives, trains and railcars, the cost of the Italian high-tension d.c. system is about £8,250 per route mile.

Electric Traction Progress

IN the February issue of the Journal of the Institution of Electrical Engineers there is an article on electric traction by Professor F. J. Teago, D.Sc., which sets out to give a review of railway electric traction progress during the years 1933-36. As Professor Teago states, the difficulty of obtaining the correct statement of such a seemingly simple fact as the length of an electrified line is very great. We ourselves, among others, have experienced this difficulty, but the magnitude of his task in obtaining figures for the world's principal electrifications over a period of four years appears to have caused the professor to throw discretion and any insistence on accuracy to the winds, despite the help he has received from diplomatic circles as well as from well-known engineers. The result is one of the most inaccurate lists of railway electrification we have seen, and it does not seem advisable to file it for reference. Among the works shown as completed is the 125-mile line of the M.Z.A. from Madrid to Cuenca; it is true that preliminary studies were made for such a conversion, but even before the present trouble in Spain, diesel railcars had virtually shelved the possibility of further studies. Again, the Bilbao—Portugalete line does not belong to the Vascongados Railway, nor was it electrified within the period under review. Professor Teago would have us believe that the Munich—Regensburg line of the German State Railway and the Beziers—Neussargues route of the P.O.-Midi have been converted since the beginning of 1933, and apparently he has induced the L.M.S.R. to take over the Glasgow subway as part of some Glasgow—East Kilbride electrification proposal. The Rand electrification scheme is credited with merely 20 miles, whereas the programme covers the conversion of over 120 route and over 300 track miles. The list of electrified steam railways published in the *Universal Directory of Railway Officials & Railway Year Book* is revised annually, and is as reliable a list as we know. Rather than spend untold time and trouble in making lists from not purely railway sources it seems that this book might be used as a basis with great profit in future.

ARTICULATED TRAINS FOR NEW YORK SUBWAY

*A description of the electrical
equipment of 75 cars made
up into 25 train units
for the 600-volt third-
rail system*



*One of the 720-h.p. twelve-motor
five-car articulated electric trains opera-
ting on the lines of the Brooklyn-Manhattan
Rapid Transit Corporation in New York*

AMONG the stock introduced on the New York urban and suburban services recently are 25 five-car articulated trains built by the Pullman Car & Manufacturing Company for operation on the Brooklyn-Manhattan Transit lines of the New York Rapid Transit Corporation. Each unit has a seating capacity of 198 and a large amount of standing room, as may be seen by the accompanying illustration of an interior. Air and eddy-current braking systems are incorporated, and the doors can be air-controlled from either driving position whatever the direction of running.

Traction Motors and Motor-Generator Set

All the electrical equipment was supplied by the General Electric Company, and includes 12 self-ventilated 60 h.p. traction motors per unit, that is, one on each axle. The drive to the axle is through a double universal joint and single reduction gears, the pinion of which is supported in the gear casing; the gear casing itself is carried on the axle through Timken tapered roller bearings. Plain axle-boxes are used in these trains, but in roller bearing applications a ground brush holder, with a brush riding on the axle, is attached to the gear casing to provide a return path for the traction current to the rail, so that this current will not pass through the roller bearings. The armature shafts are carried on a ball bearing at the commutator end and a roller bearing at the drive end. A removable multiple fan bolted to the drive end of the armature draws in air through the handhole cover, dis-

tributes it in two paths—one under the commutator and through longitudinal ducts in the armature core, and the other over the armature surface and around the field coils—and expels it through openings in the drive end of the motor frame. The eddy-current brake coils in the motor are ventilated by air drawn in through the expanded metal screen in the brake housing, passed over the coils, and expelled through air holes in the brake ring. The torque and brake reactions of the motor are taken to the bogie frames through double rubber springs.

The motor-generator set is a four-pole d.c. machine with commutating-pole compound motor and shunt generator, and designed for operation on 600 volts line potential to furnish power at 43 volts for battery-charging. An external regulator maintains constant generator voltage for a given load with variation in the third-rail voltage between 450 and 625. The set is self-ventilated by a fan mounted on the armature shaft at the generator end. Air is drawn through a cleaner which is attached to the motor end of the set, passes through this end of the frame to the interior, and is expelled through openings in the frame at the fan end. Ball bearings are used in both ends of the set. There are two motor-generator sets in a five-car train, and they are mounted on the second and fourth cars.

Control Equipment

The traction motor control is of the PCM type, that is, of the same pattern as that fitted by B.T.-H., to one

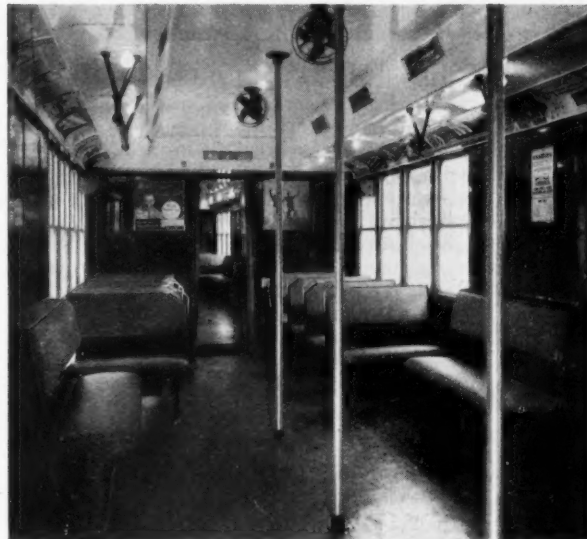
of the new Piccadilly Line trains of the London Passenger Transport Board, and described in the issue of this Supplement for December 11, 1936. It is arranged for multiple-unit operation. Line breakers, motor accelerating controllers, power switches, reversers, and other equipment handling directly the traction motor power are housed as three complete groups, one on the front car handling the current for the motors on the first and second bogies, one on the centre car dealing with the motors of the third and fourth trucks, and one in the rear car for the fifth and sixth trucks. All are operated from the controller in each driving cabin.

The master controller has main and reverse handles which are mechanically interlocked to prevent moving the main handle unless the reverse handle is in an operative position; the reverse handle cannot be moved to the off position, or removed, unless the main handle is in the off position. The main handle has six positions, viz:—

1. Off.
2. Switching.
3. Series (low rate acceleration).
4. Parallel (low rate acceleration).
5. Parallel (intermediate rate acceleration).
6. Parallel (high rate acceleration).

With the master controller in the switching position, control circuits are energised so that power is applied to each group of four motors in series with full resistance in series with each group. Also, by turning the master controller to this position after having been advanced to the series or any parallel position, the acceleration sequence may be stopped at any point. Advancing the main handle to the series position permits the acceleration sequence to advance to the point where all resistance is cut out, but with the motors connected in groups of four in series.

Advancing the main handle to any of the parallel positions permits the series-parallel transfer switch to operate. This switch changes the motor circuits so that power is applied to groups of two motors in series with the proper



Interior of Brooklyn-Manhattan Rapid Transit car

amount of resistance in series with each group. The acceleration sequence then continues to the point where all resistance is cut out and the motor fields are shunted. The rate of acceleration in parallel depends on which parallel position the main handle is held. The main handle can be quickly advanced to any position, the accelerating sequence advancing automatically at the proper rate to the corresponding point.

The reverse handle has three positions, "off," "forward," and "reverse." This handle governs the direction of car movement and in addition sets up auxiliary circuits such as signal lights and door control. The main handle is of the tip-up dead-man release type which functions to cut off power and apply emergency brakes to the train if the hand is removed from the handle unless the reverse handle is turned to the "off" position.

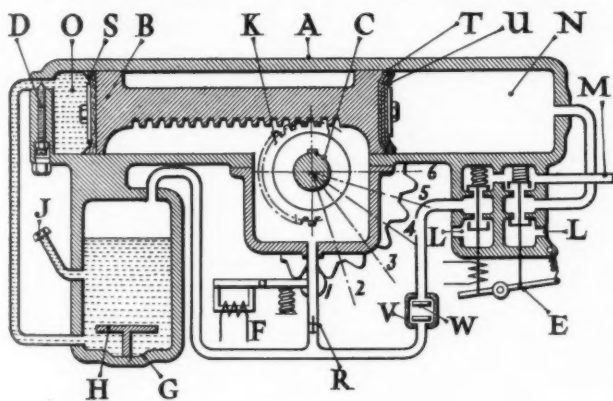
The control fingers are all of the cam-operated type, the upper group being operated by the main handle and dead-man's release cam, and the lower group by the reverse handle.

The line breaker consists of two electro-pneumatic contactors connected in series and mounted in a box insulated from the car underframe. Each contactor is equipped with a powerful magnetic blowout and is capable of interrupting any overload that may occur. Included in the box is an overload relay with two separate series operating coils to provide the same degree of protection whether the motors are connected in series or parallel. When tripped, the relay latches in position and is reset by energising a reset coil.

Motor Control Group

This control group consists of a rigid supporting frame with light-weight enclosing cover and contains the principal apparatus for control of the traction motors. The motor controller functions to cut out the accelerating resistors under control of an accelerating, or current limit relay. The eleven main contact units are cam operated and do not require blowouts, as the sequence is such that they are not required to open when carrying current.

The cams are mounted on a shaft rotated through a rack and pinion from the operating mechanism shown schematically on the accompanying diagram. Energising the coil of the magnet valve exhausts air from the air cylinder to the atmosphere and admits compressed air to



- | | |
|-----------------------|----------------------|
| A AIR ENGINE CYLINDER | L EXHAUST |
| B AIR ENGINE PISTON | M TO AIR RESERVOIR |
| C CAM SHAFT | N AIR CYLINDER |
| D TIMING ADJUSTMENT | O HYDRAULIC CYLINDER |
| E MAGNET VALVE | R CHECK VALVE |
| F STOP COIL | S PISTON PACKING |
| G LIQUID RESERVOIR | T PISTON PACKING |
| H BAFFLE | U EXPANDER |
| J LIQUID FILLER PLUG | V EXPANSION CHAMBER |
| K PINION | W BAFFLE |

Operating mechanism diagram of PCM control

the reservoir containing the liquid (a special light oil). This reservoir is connected to the hydraulic cylinder through an adjustable orifice to restrict the flow of liquid and, therefore, the maximum speed at which the camshaft can rotate. De-energising the magnet valve reverses the flow of air and liquid by exhausting the air from the liquid reservoir and admitting compressed air to the air cylinder. The liquid is therefore forced past the timing adjustment back into the reservoir as the piston returns to its original position, rotating the camshaft in the opposite direction.

It should be noted that the magnet valve is kept energised for rotating the shaft in one direction (series acceleration) and is continuously de-energised to rotate the shaft in the opposite direction (for parallel acceleration). The movement of the piston and rotation of the shaft can be stopped in either direction by energising the stop coil. This powerful coil, when energised through the contact of the accelerating relay, engages a roller in any one of the notches in a starwheel mounted on the shaft.

An interpoint interlock operated by the stop coil armature closes contact momentarily as the shaft rotates from one step to the next. This contact serves the dual purpose of helping to pick up the accelerating relay by means of the lifting coil between steps, and also energises the stop coil so that the roller is prepared to stop the shaft rotation at the next starwheel notch.

The series-parallel transfer switch, or power switch, is electro-pneumatically operated and functions to effect the change in resistor and motor connections from series to series-parallel. The mechanism operates three main contact units of the type used on the motor controller, but provided with blowout coils and arc chutes to interrupt current. In the normal position (magnet valve de-energised) the centre contact unit is closed and the outer ones open. Energising the magnet valve admits air into a cylinder, forcing out a piston against its return spring. The piston moves a crosshead on which are mounted three forked castings which are set in such a position to open the centre contact unit and close the outer contact units. Thus, by a single movement of the switch, the transfer from series to parallel is quickly and positively obtained. The transition is of the bridge type without shock or interruption of power on any motor.

The main armature of the accelerating relay is operated by the combined effect of two series and three shunt coils. Each series coil is in series with each group of two motors, their combined effect being the same whether the motors are in series or parallel connection. When the relay is picked up, the main contact closes, energising the stop coil of the motor controller and preventing any advance. When the current in the series coils of the relay drops below a predetermined value the relay will drop out, permitting the controller to advance to the next acceleration step.

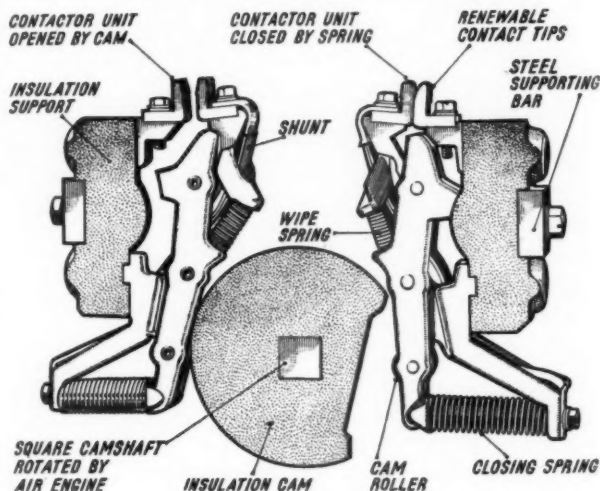
The three shunt coils are wound on a single spool, the upper section containing two rate coils wound concentrically; the lower section is the lifting coil. One of the rate coils is controlled directly from the master controller through train wires to give primary control of the accelerating rates. By energising this coil at three values of current (one being zero current), the drop-out of the relay referred to current in the series coils can be given any one of three values corresponding to three rates of acceleration with maximum weights of car and load. Secondary control of drop-out of the relay to compensate for lighter loads is effected by energising the other rate coil through contacts on the retardation controller.

The lifting coil is provided to pick-up the relay armature positively as the motor controller advances from one step to the next. On the bottom of the relay is mounted a separate magnet coil and armature for mechanically

closing and holding the main armature. This auxiliary coil is the holding coil and is energised whenever the master controller main handle is placed in the switching position. The high speed potential relay opens the line breakers in case the third-rail voltage drops or is momentarily interrupted, as by third-rail gaps, thus protecting the motors against abnormal voltage surges.

The field shunting control group combines into one assembly the inductive shunts for motor fields, the resistors for obtaining the different steps on the electro-pneumatic power switch for controlling the shunting. The normal position of the switch (with magnet valve de-energised) is with all contacts closed and, therefore, the motor fields shunted the maximum amount. Energising the magnet valve quickly opens all contacts to apply full field to the motors. When the magnet valve is de-energised, air is exhausted slowly from the cylinder which closes the contacts in sequence, due to their different distances of opening. Five steps of field shunting are thus obtained in the time of approximately 2.5 sec. required for all contacts to close.

The main power switch consists of a 400 amp. SPDT



Cross section of cam and cam-operated resistor contactors, PCM control, New York electric trains

knife-blade switch mounted in a metal box. An 80 amp. fuse for auxiliary circuits and an inspection plug are included. The motor lead coupler serves to provide a ready means of disconnecting the flexible cables carrying motor and eddy-brake current between the truck and the frame of the car. By unlatching and pulling down, the plug portions may be removed with the trucks. Six contacts are provided, the four central ones carrying motor current and the outer ones the current for exciting the eddy-brake fields.

Eddy Current Brake

The eddy current brake mounted on each motor utilises the effect of magnetic drag obtained whenever a conducting material moves through a magnetic field. A large disc rotates between a series of field coils, the amount of braking being dependent on the strength of the field and the speed of the disc. No braking effect is obtained with the disc at rest, and, therefore, this type of brake does not perpetuate any skidding. To obtain excitation of the eddy-brake field coils, the traction motors are connected as generators, their fields in turn being separately excited from the car battery. The braking is therefore not dependent on the drawing power from the third rail and

is not subject to surges due to voltage interruptions or third rail gaps.

The brake control group is constructed similarly to the motor control group. It contains all eddy-brake control devices and also the motor reverser which is included in this group to simplify the connections between motor and brake circuits.

The motor reverser has eight main fingers for reversing the fields of four motors. Separate magnet valves, properly interlocked, throw the reverser to either of its two positions. The braking transfer switch, or power switch, is of the same construction as the series-parallel transfer switch. Here, however, the switch includes five contact units, three of which are provided with blowouts and arc chutes. The centre contact unit is normally closed while the outer four are normally open. The magnet valve for operating this transfer switch has two separate coils wound on the single spool. One coil is to operate initially the switch when the electric brakes are applied, after which this coil is de-energised by a relay, but the magnet valve is held in the energised position by the second coil until the car comes nearly to a stop or the electric brakes are released. The transfer switch, when thrown to the braking position, connects the four motor armatures in series and in circuit with the eddy-brake fields of the four motors. The exciting fields of the traction motors are also connected in series and draw current from the batteries through the eddy-brake regulator.

This eddy-brake regulator automatically governs the amount of excitation in the motor fields to cause them to generate the proper amount of current through the eddy brake fields. The amount of eddy brake field current generated is also automatically regulated in proportion to the straight air-pipe pressure of the air brake system under control of the brake valve and retardation controller.

As long as the generated current is in proportion to this straight-air pressure, the pressure is prevented from being duplicated in the air brake cylinders by the action of the suppression magnet, that is, all of the braking is obtained from the eddy brakes within its capacity. However, when speed is reduced to approximately 18 m.p.h. or slower, the eddy brakes begin to fade off, due to the limits of amount of excitation for motor fields that can be drawn from the batteries and due to the brakes losing their

effectiveness at the low speeds. As this occurs, the suppression magnet permits the air brake cylinder pressure to build up to replace the braking effort not obtainable from the eddy brakes.

A lock-out relay serves to change the connections to the coils of the magnet valve of the braking transfer switch after the braking circuits are established. The braking transfer switch returns to its normal position as the car slows down to nearly standstill, thus removing battery excitation from the motor fields and setting up the motor circuits for acceleration. The lock-out relay, however, remains energised until the brake valve is moved to the release or handle off positions.

Auxiliary Control Equipment

The auxiliary switches are mounted on the second and fourth cars and contain a 75 amp. SPST knife-blade switch and 80 amp. fuse for supplying power to the motor-generator set and other auxiliary circuits on these two cars.

The generator control group contains the apparatus for controlling the output of the battery-charging motor-generator set. The voltage regulating relay is connected to the motor at all times and automatically controls the generator voltage over the normal range of variations in load and speeds of the set. The regulator is designed to provide a drooping characteristic, that is, the regulated voltage decreases as the load increases. When adjusted to hold 43 volts at no load, it will hold 38 volts at 50 amp. load. This characteristic eliminates the need of a current-limiting resistor between the generator and battery and ensures proper load division between the two generators operating in parallel.

The reverse current relay controls the operation of the generator contactor to connect the generator to the battery and load when the generator voltage builds up to the proper value, and disconnects the generator when its voltage falls to a value such that current tends to flow back through the generator. To protect the generator against overloads, a circuit breaker with thermal trip is provided. In the tripped position a white target shows. The breaker is reset by moving the handle to the off position, and then may be closed by moving the handle to the on position.

Southern Electrification Notes

SINCE March 7 a number of test runs have been made between Waterloo and Fratton with four-car electric train sets in anticipation of the early opening of this main section of the London—Portsmouth electrification. Work is proceeding on the re-modelling of Portsmouth Harbour station, including lengthening the platforms to take 12-car electric trains.

During the year 1936 a total of £983,000 was expended on electrification by the Southern Railway. According to Mr. R. Holland-Martin, the Chairman, the number of passengers in the electrified area increased by over 8½ millions in 1936 with an increase in receipts of £245,000. As compared with 1932 the increase in the number of passenger journeys throughout the whole Southern system was no less than 43,000,000 and of these the electrified area claimed 35,000,000. This represented a growth in the number carried in the electrified area of 15 per cent. and an increase in the passenger receipts in that area for 1936 of no less than £1,054,000 or nearly 17 per cent.

The Southern has undertaken to expend during the next

five years practically the whole of the amount of the loan from the Railway Finance Corporation, in extending the system of electrification, and it is proposed to bring the various extensions into use in accordance with the following programme:

London to Portsmouth via Guildford, Woking to Alton via Aldershot and Staines to Weybridge in July, 1937.

London to Portsmouth via Horsham, including the lines from Three Bridges to Horsham and from Worthing to Fratton and the branches to Bognor Regis and Littlehampton in July, 1938.

Staines to Reading, Ascot to Aldershot and Aldershot to Guildford in January, 1939.

Sevenoaks to Hastings via Orpington and Crowhurst to Bexhill in July, 1939.

Gravesend and Swanley to Chatham and Gillingham and Strood to Maidstone in 1940.

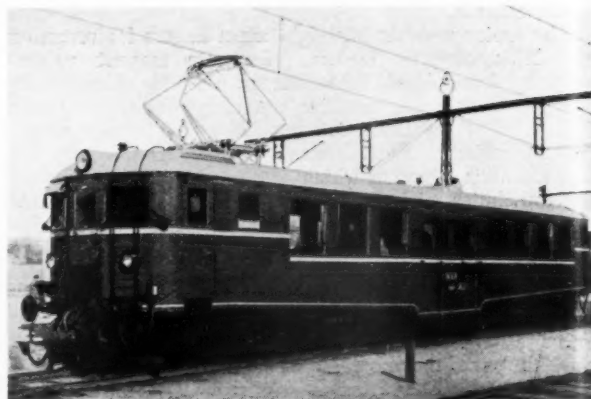
Mr. Holland-Martin stated that his company was satisfied that each of these schemes of electrification will conduce to the comfort and well-being of the regular travellers and would equally be of benefit to the shareholders.

OSLO SUBURBAN ELECTRIFICATION

THE first section of the Oslo-Ski line, from Oslo to Kolbotn, about 8 route miles, is now being operated electrically so far as the important suburban traffic is concerned, and the conversion of the line on to Ski is proceeding. For the last 10 miles, from Ljan to Ski, the line hitherto has been single, but the track is being doubled and both up and down lines electrified in anticipation of increased traffic from electrification. The system used is the Norwegian standard, viz., 15 kV. 16½ cycles single-phase.

Electric energy is supplied at Oslo from two generating stations. That to the west is the Hakavik hydro-electric plant built some years ago by the State solely for the supply of current to the Drammen lines; this plant supplies single-phase energy. On the east side of Oslo is another hydro-electric station, Rånåsfoss, which supplies three-phase current to a motor-generator station at Alnabru, for conversion to single-phase energy. The two plants are paralleled on the single-phase side through a switching station in Oslo.

On the open line wooden poles are used for the support of the overhead lines, which are of the Norwegian Railway's standard type; at the Oslo end of the line steel masts are used to conform to the existing layout in and around Oslo, but to the south the masts in the stations are of concrete with cantilever arms of steel. The cross section of the contact wire is 100 mm.² and of the catenary 50 mm.²; both are of copper. To prevent interference with communications the telegraph and telephone lines have been removed underground and transformers are connected to the contact line and to the track. These cables are armoured 7 quad and are buried in the ground about 2·5 m. (8 ft. 3 in.) from the track centre. The system has been carefully balanced to eliminate cross-talk and interference, and there are loading pots every 1,835 m. (2,000 yd.). The induced voltage to ground from the fundamental of the traction current has been measured at 1·3 volts per 100 amp.-km., and with this low figure the telegraph system can be worked safely with earth return.



One of the four-motor single-phase motor coaches used on the Oslo—Kolbotn suburban services

The harmonics of the traction current do not introduce any telephone interference.

The train service from Oslo to Kolbotn is operated by motor-coaches hauling two or three trailers, the outer end vehicle being a driving trailer. Each motor-coach has four nose-suspended motors with a one-hour rating of 118 kW. at 255 volts and at a track speed of 42 km.p.h. (26 m.p.h.). The wheels are 810 mm. (32 in.) in diameter and the gear ratio is 1:4·27. The transformer has a capacity of 488 kVA. Current is collected by a single pantograph. Each motor-coach tares 41·8 tonnes, of which the electrical equipment accounts for 14·6 tonnes and the mechanical portion for 27·2 tonnes. The seating capacity is 68, and there is a lavatory and a light baggage room. The top speed in normal service is 70 km.p.h. (43·5 m.p.h.). The electrical equipment for these motor coaches was supplied by the Brown Boveri organisation.

MOSCOW METRO.—Another section of the Moscow underground, from the Smolenskaia Rinok to the Kiev main line station was opened at the beginning of March. The escalators at the new stations are being given a great increase in speed compared with those installed up to the present, principally because parts of the new lines are at deeper levels. Great difficulty has been experienced in keeping watertight the tubes and stations at certain points on the original Metro line, and repair gangs are at work on most nights, but a new waterproof material for lining the tunnels has been evolved at the Soviet Institute of Research.

U.S.S.R. LOCOMOTIVE MODIFICATION.—The 2,720 h.p. Co-Co electric locomotives of the VL19 type, such as are used on the 3,000 volts d.c. lines in the Caucasus, Donbass, Urals, and Murmansk districts are being fitted with hydraulic shock absorbers, and following the consequent suppression of numerous oscillations the permissible maximum speed will be raised from 70 to 100 km.p.h.

HAMBURG SUBURBAN RAILWAYS.—The Reichsbahn is to modernise the Hamburg city and harbour railways, and

in order to increase the speed of the trains the single-phase 25-cycle current is to be raised from the present tension of 6,600 volts to about 7,500 volts. The present twin-car four-axle articulated units are to be replaced by 55 triple-car non-articulated sets, each composed of two motor-coaches and a trailer between.

BELGIAN ELECTRIFICATION.—In the first eight months of its operation the Brussels—Antwerp 3,000-volt d.c. electrified line, 27·5 miles long, accounted for 8,498,780 kWh. of energy for traction purposes and 555,970 kWh. for train heating. The number of train-unit-km. in this period was 1,381,329, each unit consisting of a four-car set. The aggregate number of trains run was 31,007, and the maximum daily traffic was 205 trains. A commission appointed to study the electrification of the Luxembourg and Ourthe lines presented its report some time ago, and considered that if the enterprise was assisted financially by the State the electrification might be undertaken. The directors of the Belgian National Railways later declared themselves willing to subscribe the amount which they would normally expend on these lines if steam traction was retained.

SOUTH AFRICAN ELECTRIFICATION NOTES

Comparison of traffic on the Natal main line; main line extensions; and the Reef suburban and interurban system

IN a paper read before the South Africa centre of the Institute of Transport last year, Mr. H. Cheadle, Traffic Manager of the South African Railways, made some interesting comparisons between the route and traffic of the Natal main line and those of the Harlowton—Avery section of the Chicago, Milwaukee, St. Paul & Pacific Railroad in the U.S.A. Both lines are electrified on the 3,000 volts d.c. system and both have a maximum grade of 1 in 50 and a profile of the same nature. The South African line has more 1 in 50 grades, but the American line is 440 miles long compared with the 320 miles from Durban to Volksrust, of which only 245 is electrified at the moment. On the C.M.St.P. & P. there is a continuous up grade for 200 miles, the average end to end slope being 1 in 375. The Natal line (3 ft. 6 in. gauge) has curves of 300 ft. radius; the American line (4 ft. 8½ in. gauge) has 575 ft. radius curves.

South African and American Traffics

On the American route the traffic was about 15,000 tons gross a day, while on the Ladysmith—Pietermaritzburg section the southbound traffic alone amounted to almost 18,000 tons gross a day when conversion work began, and by the time it had finished daily tonnages of 20,000 were common. Eventually the southbound tonnage rose to over 27,000 a day, with peaks of 34,000 tons, but after that traffic declined very seriously and is just beginning to rise again. The actual daily capacity of the line in the southbound direction is about 40,000 tons.

Records of the C.M.St.P. & P. line showed that after it had been electrified for nine years the gross savings, including those from another 210-mile line which had been electrified for five years, amounted to £2,480,000 after all interest and loan charges had been met. The additional investment was given as £3,125,148. In 1927 Sir William Hoy, then General Manager of the South African Railways, said in evidence before a Select Committee that based on the first six months of electric traction the profit on the Glencoe—Pietermaritzburg section (170 route miles) was at the rate of £528,000 a year, or an increased profit compared with steam of £60,000 a year.

Trains of 1,500 tons are hauled southbound by two double-bogie electric locomotives from Glencoe to Ladysmith and by three units from Ladysmith on to Pietermaritzburg. The old steam-worked trains were of only 1,000 tons weight to Ladysmith and 720 tons on to Pietermaritzburg. Despite the increase in loads the southbound time has been cut from 752 min. to 482 min.; in the northbound direction the time for the returning empties and miscellaneous freight trains has been reduced from 694 min. to 455 min. The maximum speeds have not been increased, but higher rates are maintained uphill. On long down grades the speed of the steam trains was limited to about 15 m.p.h. whereas the regenerative braking on the electric locomotives holds the train to a steady but higher speed.

Subsequent electrifications have been carried out by the South African Railways electrical department much more cheaply than the original conversion, and the Pietermaritzburg to Cato Ridge division was electrified at a cost of

£62,000 for the 26 route miles (42 track miles). In 1935 electric working began over the 60 route miles from Daimana to Harrismith, and in December last the main line trains were taken over by electric locomotives from Cato Ridge down to the coast at Durban. This last section is 45 route miles in length and the track mileage, including Congella yard, is 126. The estimated direct saving by the electrification of this line is £41,400 a year, and there are additional indirect advantages. The northern prolongation of the Natal main line from Glencoe to Volksrust, 78 miles, is now proceeding, and the estimated yearly saving ensuing from electric operation is £32,300.

The Reef Scheme

The Reef electrification is at an advanced stage, and a partial electric service is now in operation between Germiston and Wattle and Germiston and Alberton. The scheme has again been slightly extended, and Mr. Cheadle gave figures of 131 route or 350 track miles to be electrified. There are to be a dozen substations, equipped with B.T.H. rectifiers. The first of the all-steel coaches built by the Metropolitan-Cammell Carriage & Wagon Co. Ltd. and the Birmingham Railway Carriage & Wagon Co. Ltd. have been delivered. The motor-coaches weigh approximately 51 tons, of which about 15 tons is electrical equipment supplied by the General Electric Company of America. Timken taper roller bearing axleboxes are used.

The complete rolling stock programme comprises 105 motor-coaches, 60 driving trailers, and 187 ordinary trailers. Of the driving trailers, 21 are being converted from ordinary carriages and 39 are being built in the railway workshops; of the ordinary trailers 62 are being built locally and 125 are being converted from modern coaches in the railway shops. As five classes of passengers have to be catered for the basic train will be made up of six vehicles, viz., a motor-coach at each end and four trailers between, although on purely suburban services a three-car set composed of a motor-coach, a trailer, and a driving trailer will be used. It is expected that there will be a public opening ceremony in May, when the Johannesburg—Springs section is due to be opened to electric traction.

PAPERS ON ELECTRIC TRACTION.—Before the Irish centre of the Institution of Electrical Engineers, Mr. E. T. Hippisley, of the British Thomson-Houston Co. Ltd., read a paper on railway electric traction on March 18. Among those who took part in the discussion was Lt.-Col. E. O'Brien, late electrical engineer of the Lancashire & Yorkshire Railway. A paper on railway electrification from the semi-technical point of view was read before the Edinburgh Rotary Club on March 11 by Mr. P. M. Crosse, and mention was made of the Edinburgh—Glasgow route of the L.N.E.R. The same author read a similar paper before the Bath Chamber of Commerce on March 22 in which he advocated the electrification of the Great Western Railway Company's main line from Paddington to Bristol.



Express passenger train on the Pennsylvania Railroad hauled by 2-Co-Co-2 electric locomotive

NOTES AND NEWS

American Electric Locomotives.—The Utah Copper Company has ordered twelve electric locomotives, weighing 85 tons each, from the American General Electric Company.

Glasgow Subway Extension.—The Glasgow City Council has appointed a sub-committee to consider and report on the advisability of extending the city's underground line, which, since electrification, has proved most successful.

Soviet Electrification.—According to the latest figures available the electrification of steam railways in the U.S.S.R. now totals 640 route miles, all of which is on the d.c. system, at 1,200, 1,500 and 3,000 volts tension in the overhead contact wire.

Siberian Electrified Line.—It is stated that the Bielovo-Kuznetsk line in Western Siberia has been opened to 3,000-volts d.c. electric traction, and that the extension from Bielovo to the Trans-Siberian main line at Novosibirsk is in process of conversion. This line serves the coal and mineral district of the Kussbass.

P.O.-Midi Electric Rolling Stock.—The electric locomotive stock of the P.O.-Midi Railway now totals 596, of which 319 were built for the Midi division and 277 for the P.O. Under construction are 41 locomotives. There are also 159 passenger or baggage motor coaches and another 7 under construction.

Big American Conversion Scheme.—The Pennsylvania Railroad is to electrify all its passenger and freight lines east of Harrisburg, Pa. This means that the main and subsidiary lines from the Philadelphia area along the main route to Chicago as far as Harrisburg will be converted to the standard 11 kV. 25-cycle single-phase system. The new scheme will form an extension of the present New York-Philadelphia-Washington electrified network, which it will join at Paoli. The new work will involve the electrification of 315 route and 773 track miles, and will comprise the main line from Paoli through Lancaster to Harrisburg, and several freight lines near the Susque-

hanna river and the towns of Morrisville, Columbia, and Perryville. The large yards at Harrisburg, Enola, and South Amboy are included in the conversion programme. The photograph of the Pennsylvania electrically-hauled express train published on this page is reproduced by courtesy of the editor of the *Mutual Magazine*, the Pennsylvania Railroad staff magazine.

Mersey Railway Electrification.—To cope with the increased train service which will come into force when the L.M.S.R. Wirral lines are electrified, the Mersey Railway is to augment the supply from its own power station by purchasing further current from the Birkenhead municipality, and to convert this a.c. to the 650 volts d.c. for the third rail; two 750-kW. rectifier sets are to be installed in the Birkenhead substation.

Swedish Electrification.—Authority is now being sought for the allocation of 12,000,000 kr. to begin the electrification during the coming year of the Ange-Långsele; Bräcke-Östersund; and Gothenburg-Uddevalla lines, with a total length of 200 route miles. All these routes have been under the heading of projected electrifications for some time, and they were so shown in the map of Swedish electrified lines published on p. 258 of the February 5 issue of this Supplement.

Italian Electrification.—In connection with the conversion of the Milan-Bologna-Ancona line, announced in the February 5 issue of this Supplement, and the rearrangement of the 650-volt d.c. Italian State lines from Milan to Varesio and Porto Ceresio, about 50 miles of tracks in and around Milan central station are to be electrified. A total of 12 substations is to be built for the Milan-Ancona line, and one of these plants will be located in Milan station. The low-tension lines to Porto Ceresio are to be converted to 3,000 volts d.c. to obviate any change of system in Milan and to enable the same system to be used between Milan and Gallarate, where the same route serves both the electrified lines to Lake Como and the main line to Domodossola. It is proposed to make use of fast light railcars, suitable for multiple-unit operation when desired, to speed up and develop the traffic round Milan.